Reliance HY-CROME *Spring Washers*

The Comet
NEW YORK, NEW HAVEN and
HARTFORD RAILROAD CO.

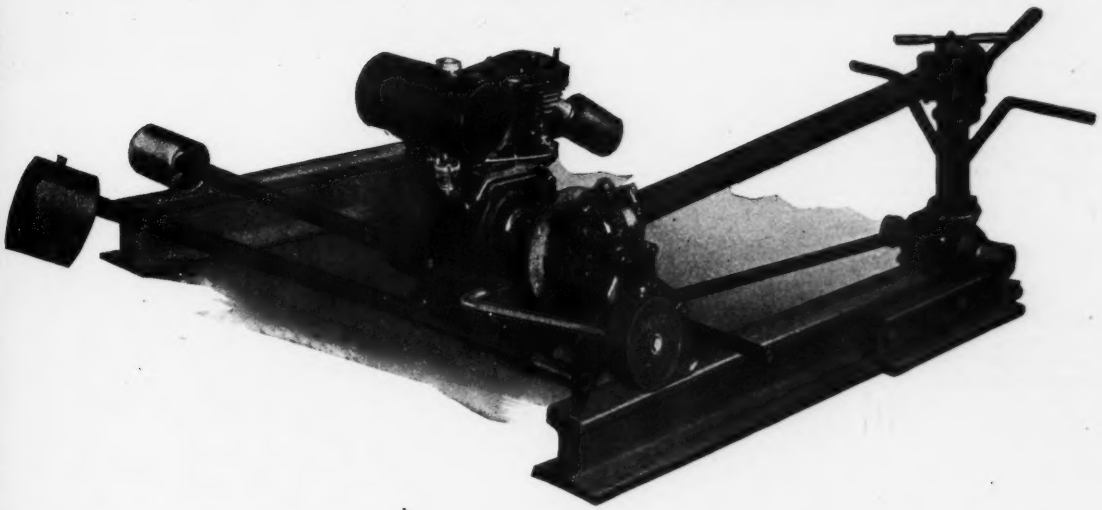
● Reliance HY-CROME Spring Washers are made for every railroad application—especially engineered and scientifically manufactured.

EATON MANUFACTURING COMPANY
RELIANCE SPRING WASHER DIVISION
MASSILLON, OHIO

HY-PRESSURE
HY-CROME
"Edgemark Quality"

Use

Raco Power Track Machine



When

Tightening out of face.

Removing worn rail.

Installing new rail.

Changing angle bars.

Shimming angle bars.

Tightening frog bolts.

Welding rail.

Grinding or slotting rail.

Installing screw spikes.

Because

It saves its cost in approximately 35 working days.

And because machine tightening has the following very important advantages:

Puts uniform tension on all bolts.
Costs one-third of hand tightening.
Lasts more than twice as long.
Greatly reduces rail batter.
Prevents frozen joints.
Saves joint ties.
Reduces angle bar wear.
Extends tamping periods.
Makes better riding track.
Hence saves rolling stock.
Confines expansion to individual rails.
Extends life of signal bonds.

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE

405 LEXINGTON AVENUE

(Chrysler Building)

NEW YORK

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 29, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

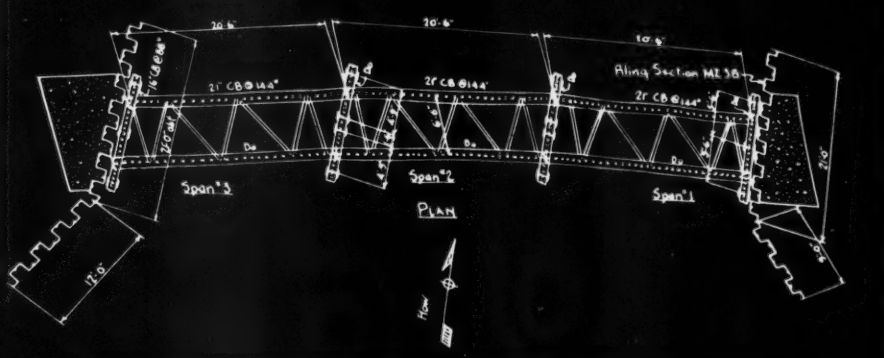
The Taming

ENGINEERING FACTS

Here are the details of this simple, workable, low-cost construction. You can see that the piles were driven in perfect alignment and the new trestle constructed in place, with no interruption of switching service to the Commercial Shearing & Stamping Company's plant.

The trestle is entirely welded, no bolts or rivets being used. It is designed to carry an E-60 loading plus 75% impact. The piles were driven to refusal — 35 to 40 feet down — with a No. 7 McKiernan-Terry hammer.

Notice also how the inexpensive retaining wall of USS "Z" Piling permitted the use of longer approaches, reduced the length of the trestle, and, consequently, the cost of the entire job. (Porterfield-Binger Construction Co., General Contractors).



. . . a simple, workable, low-cost solution constructed under traffic.

ng of Crab Creek

CRAB CREEK is no ordinary stream - - -
Near Youngstown, Ohio, this unpredictable little water-course drains an unusually large area. After an ordinary summer rain it may swell to remarkable proportions.

Then, with reckless abandon, Crab Creek discharges this water beneath an important New York Central side track. Important because any interruption in switching across Crab Creek would seriously interfere with a busy plant of the Commercial Shearing & Stamping Company.

Their old Crab Creek trestle recently became unsafe. In designing a replacement, their engineers faced two problems: they had to maintain frequent switching service during construction; and they wanted to avoid falsework with consequent danger of sudden washouts from Crab Creek's high waters.

No solution seemed satisfactory. One was too costly; another would necessitate a temporary trestle; a third required cribbing during construction which Crab Creek might wash away.

Then they investigated USS Steel Bearing Piles. Here they found the answer to their problems — a simple, workable, low-cost solution. This is what the plant's general manager says:

> **"Thanks to USS Steel Bearing Piles, we were able to build this new trestle without disturbing the old one, without falsework and with no interruption whatsoever to our operations."**

Thus Crab Creek was tamed . . . with the aid of USS Steel Bearing Piles.

By specifying USS Steel Bearing Piles you can obtain many advantages. These modern piles drive easily. They can carry exceptionally heavy loadings per pile. They resist large lateral forces. They reduce scour hazard. They can act as columns of trestle bents. They have been driven in single lengths up to 128′6″.

USS Steel Bearing Piles are the strongest — the most permanent — the most easily driven — the deepest penetrating form of bearing piles available.

• • •

FREE BOOKLET. *80 pages fully illustrated, showing typical applications of USS Steel Bearing Piles. Complete foundation data. New material never before generally available. You are invited to write for a copy.*

U·S·S STEEL BEARING PILES

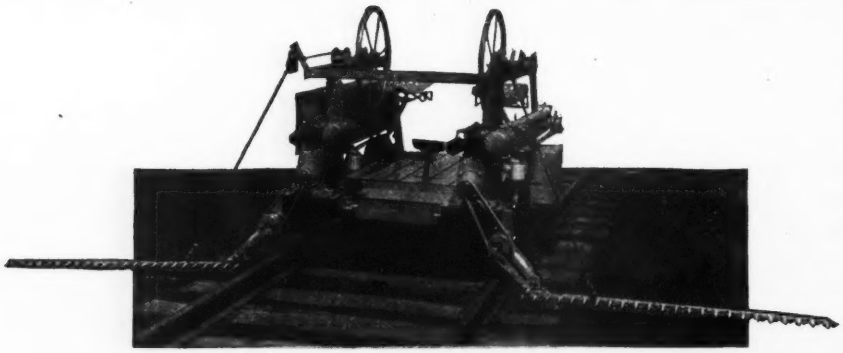
CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh *Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* United States Steel Products Company, New York, *Export Distributors*

Here you see Crab Creek on its good behavior — and its new trestle carried on USS Steel Bearing Piles. Notice the neatness and simplicity of this construction. Notice also how USS "Z" Piling provides a safe, low-cost retaining wall to guard against high waters.

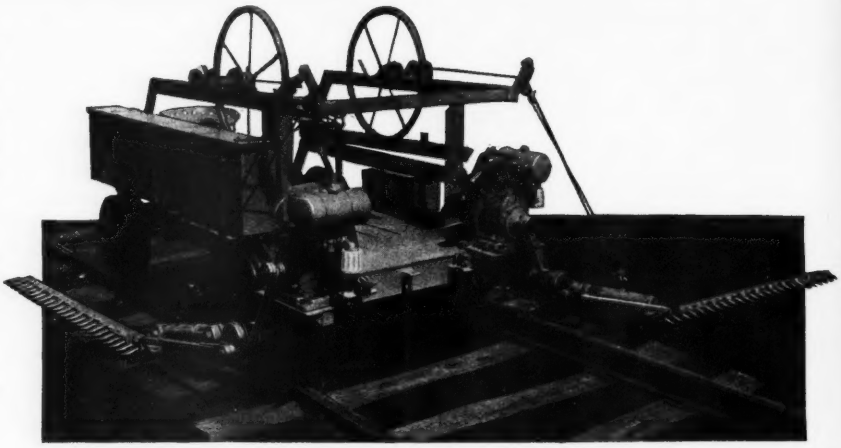
UNITED STATES STEEL

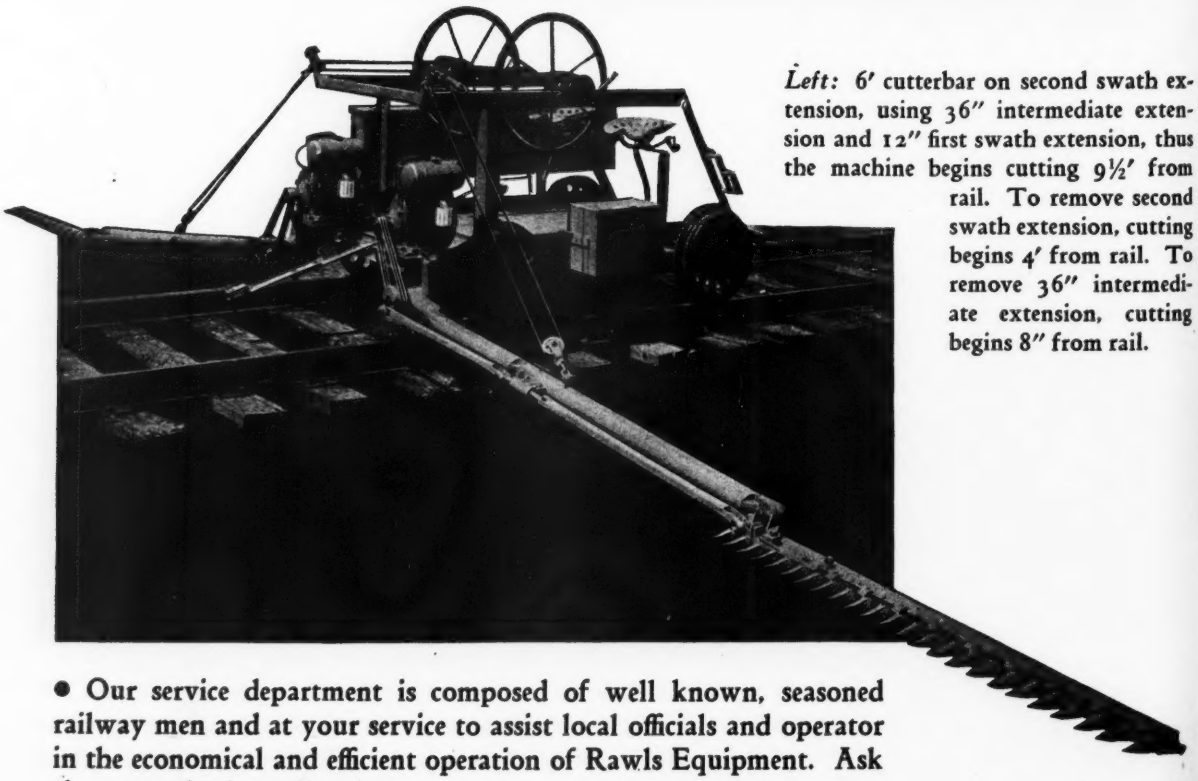


Left: 12″ first swath extension cutting begins 8″ from rail. Intermediate extensions are available for placing cutterbar to begin cutting any desired distance from rail, beginning 8″ from rail in 6″ steps up to 54″. Second swath extensions can be used with any first swath or intermediate extension. ALL pictures on this page made from same machine, using different extensions.

Right: The Rawls M-5 is the only mower available having full automatic spring trip cutterbar as shown, thus a speed up to 20 miles per hour can be attained, without unusual wear or breakage to machine or hazard to operator. Weight 2250 lbs. So balanced that two men can easily remove at highway crossing.

Rawls M-5 Mowers may be used in tandem, cutting four 6′ swaths simultaneously.





Left: 6′ cutterbar on second swath extension, using 36″ intermediate extension and 12″ first swath extension, thus the machine begins cutting 9½′ from rail. To remove second swath extension, cutting begins 4′ from rail. To remove 36″ intermediate extension, cutting begins 8″ from rail.

• Our service department is composed of well known, seasoned railway men and at your service to assist local officials and operator in the economical and efficient operation of Rawls Equipment. Ask the man who has a Rawls.

• One of the major Railways purchased 5 of these machines in 1935; 5 in 1936, and 11 in 1937. Total of 21 Rawls M-5 Mowers on this Railway. This being only one instance in which the popularity of Rawls M-5 Mowers has been substantiated with heavy repeat orders. The operating maintenance of these mowers has been exceedingly low, with no annual overhauling expense. We believe the Rawls M-5 or Z-1 Mowers will run 5 to 8 years before general overhauling expense is necessary.

The Rawls Railway Mower Model Z-1 has proven economical and efficient performance. This mower has the same engine and cutting apparatus as the Rawls M-5 Mowers. Has one cutterbar, cuts center of track and up to 9′ out from the rail as shown in the above cut, altho has no automatic spring trip cutterbar, has automatic spring trip towbar. Therefore the mowing speed is reduced to approximately one-fourth as much as compared with the Rawls M-5 Mower. The Z-1 has proven very profitable for short line or branch line mowing.

The Detroit Motor Scythe will do the work of six men with hand scythe. Cuts 30″ swath, air-cooled motor. Operates 4 hours on ½ gallon of gasoline. Weight 135 lbs. Over 3000 now in use. Price $125.00 F.O.B. Detroit, Michigan. S. E. RAWLS COMPANY, EXCLUSIVE RAILWAY DISTRIBUTORS IN THE U. S. A. FOR DETROIT MOTOR SCYTHE.

Immediate shipment at present on M-5, Z-1 or Detroit Motor Scythe.

May we solicit your further inquiry.

S. E. RAWLS COMPANY

(Successors to Rawls Mfg. Company)

STREATOR, ILLINOIS

THE HOME OF RAWLS MOWERS

Manufacturers of Special Mowing Equipment Exclusively for over a quarter of a century.

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SECTIONAL PLATE PIPE AND ARCHES

NO "SLOW ORDER" HERE

No "Slow Order" was necessary on this Toncan Iron Full Round Sectional Plate installation. Traffic was maintained and trains were on time.

The 5 plate, 75 inch diameter Toncan Iron Sectional Plate Pipe was assembled away from the site, lowered into a position from where it was slipped under the failing trestle. All that remained to be done was to back-fill the structure.

This railroad chose the easy, simple and economical way to meet their problem, without tying up traffic and incurring a considerable expenditure. You too, undoubtedly can use installations of Toncan Iron Sectional Plate Pipe and Arches profitably. A card will bring you further information.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION
REPUBLIC BUILDING CLEVELAND, OHIO
TONCAN IRON — A PRODUCT OF REPUBLIC STEEL CORP.


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OPERATORS

Koppers is one of the two Largest Producers of Coal in America—The Koppers Coal Company operates 25 mines in various fields and produces coal for steam use, for domestic consumption, and great quantities for coking. The quality of all Koppers Coals and coals of many other coal companies, is checked by daily tests in the Koppers Coal Laboratories, where some of the finest coal testing equipment in America is located.

SERVES T

The Fire Hydrants around your Property should be "Western"—An exclusive ball thrust bearing makes them open easily, even after long inactivity. No freezing; no corrosion; a design that prevents flooding if the hydrant is knocked off; larger dimensions and many other advantages.

Much Railroad Paving is done with Koppers Tarmac—Tarmac is road tar which is widely used for the paving of station platforms, railroad grade crossings, parking areas, private drives, freight yards and other places. It is economical in first cost and low in maintenance.

KOPPERS

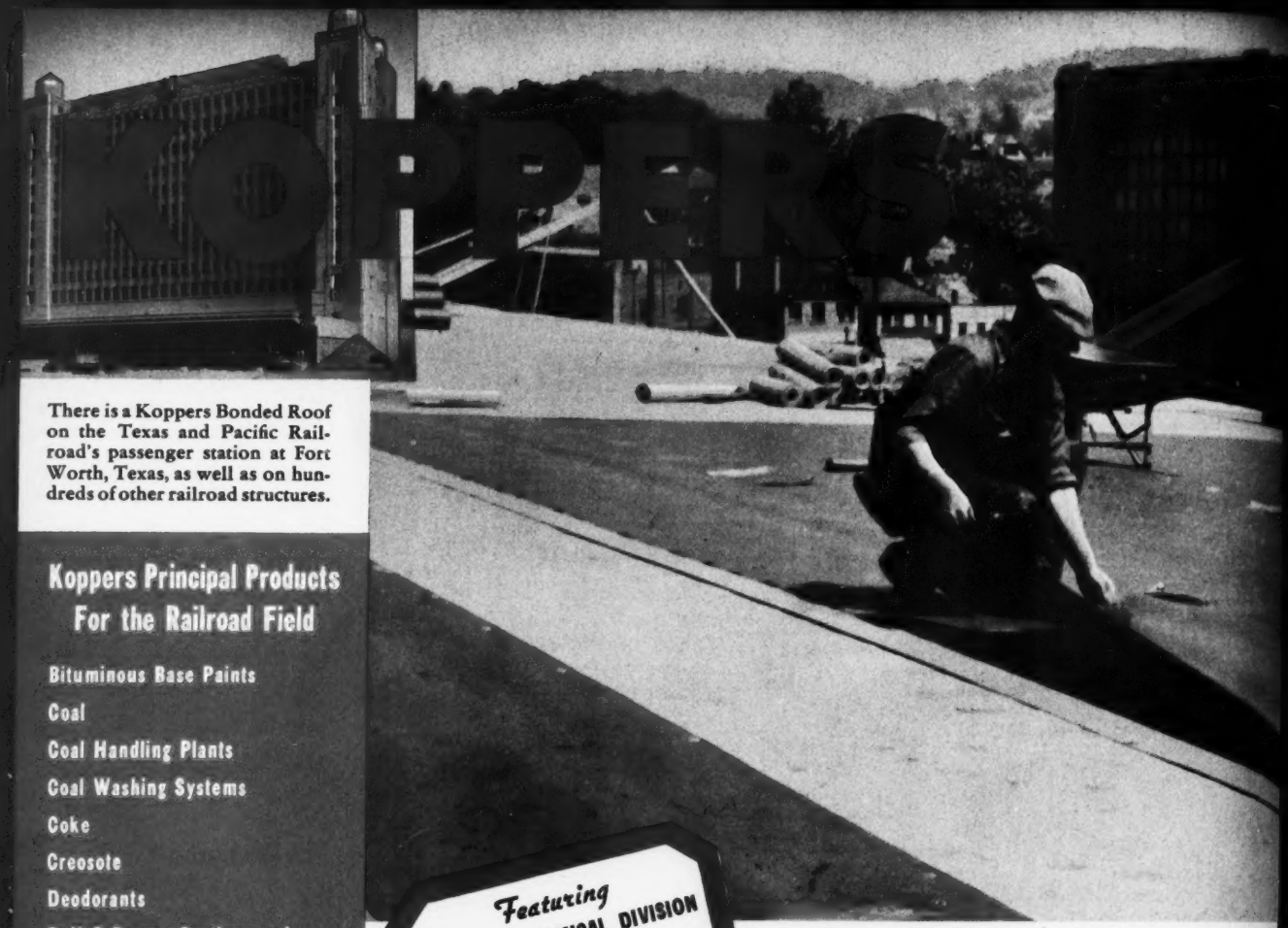
ES THE RAILROADS

Pressure-treated piling, sleepers, flooring and ties from the Wood Preserving Corporation help to keep this railroad line up out of the water.

The Wood Preserving Corporation Operates 22 Wood-Treating Plants Located for Best Service to Railroads—At these plants, there are stocks of pressure-treated cross ties, piling, poles, bridge and dock timbers, cross arms, fence posts, crossing plank, cribbing, conduit and car stock. Wood is treated with creosote oil or with salt preservatives.

American Hammered Piston Rings are used in this Oil Electric Locomotive—Wherever the service is most severe and where long life is most important, railroads choose American Hammered Piston Rings.

Koppers Builds Coal Tipples and Complete Coal Handling Systems—Koppers will design and build for you any type of surface plant, including boiler and power plants, shops, etc. Koppers also controls in this country the Rheolaveur Process, which is the most economical and efficient coal cleaning system.



There is a Koppers Bonded Roof on the Texas and Pacific Railroad's passenger station at Fort Worth, Texas, as well as on hundreds of other railroad structures.

Koppers Principal Products For the Railroad Field

- Bituminous Base Paints
- Coal
- Coal Handling Plants
- Coal Washing Systems
- Coke
- Creosote
- Deodorants
- D-H-S Bronze Castings and Iron Castings
- Disinfectants
- Fast's Couplings
- Fire Hydrants
- Insecticides
- Locomotive Packing Rings
- Pipe
- American-Hammered Piston Rings
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- Tanks
- Tarmac for Paving
- Waterproofing
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Featuring
TAR AND CHEMICAL DIVISION
PITTSBURGH, PA.

COAL TAR PITCH IS AS IMPORTANT

IN ROOFING AS CREOSOTE IS IN WOOD-TREATING

The railroads of America have saved themselves millions of dollars through their intelligent use of creosote-treated timber . . . and many railroads are saving themselves money on the same scale by the use of Koppers Coal Tar Pitch on their flat-decked buildings.

No other roofing material has surpassed the record of Koppers Coal Tar Pitch on flat-decked buildings. Coal tar pitch possesses two invaluable qualities that account for its long life and its freedom from maintenance . . . (1) coal tar pitch does not disintegrate under prolonged contact with water and (2) when small breaks occur through vibration or settlement, the pitch heals and seals itself.

Let us send you the Koppers booklet which explains why Koppers Roofs last so long and cost so little.

REM-6

Koppers Waterproofing Pitch and Tarred Fabric are widely used to waterproof the floors of bridges, to prevent leaks and disintegration of the concrete or masonry. Let us send you the booklet describing Koppers waterproofing.

KOPPERS CREOSOTE

Koppers has adequate stocks of Creosote Oil and Creosote-Coal Tar Solutions meeting A. R. E. A. and A. W. P. A. specifications. Prompt shipment can be made from shipping points throughout the country.

IF, as authorities agree, approximately 50% of track maintenance can be saved by eliminating rail joints, an entirely new picture of operating costs becomes apparent. For example, RAILWAY AGE reports that Class 1 railroads spent $456,000,000.00 in 1936 for maintenance of way. Assuming, as has been estimated, that 60% of this expenditure, or $273,000,000.00 was chargeable to track upkeep, the possible saving for last year was $136,000,000.00; an amount equal to more than 3% of the year's total operating income for all Class 1 roads combined.

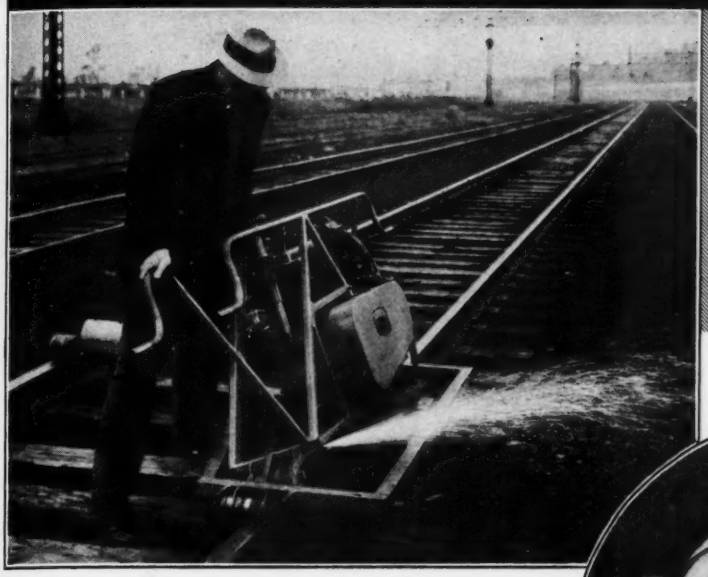
There is nothing fantastic or beyond achievement in the idea of effecting such savings through the use of continuous rails. Nor should the complete elimination of rail joints by means of welding be regarded as something which may evolve years hence. Right now, in this country, long Thermit welded rails, including jointless stretches up to 7000 feet in length, are giving good accounts of themselves; in some cases after four years of service in main line track. And, from the knowledge and experience gained through these early trial installations, the Thermit Rail Weld is rapidly being developed to a point well beyond the experimental stage.

Executive engineers and management officials are invited to write for a comprehensive illustrated report giving details of the Thermit welding process and describing more fully the installations to date.

THERMIT Rail WELDING

METAL & THERMIT CORPORATION, 120 BROADWAY, NEW YORK, N. Y.
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

Don't damage that newly laid rail



Prevent it by grinding those uneven rail ends to a uniform height

The machine shown at the upper left is the Nordberg Type CG Precision Grinder with cupwheel. The other is the Utility Grinder with flexible shaft driving a cupwheel surfacing appliance.

The cost of rail is too great to risk having it damaged the first few weeks of traffic. For that reason, more and more attention is being given to the necessity of having rail ends at joints of equal height, thereby postponing batter.

For removing mill tolerance of new rail, or for equalizing the height of cropped rail, Nordberg has developed two types of grinders for doing this work accurately and rapidly. Besides this operation, these machines can also be used for providing a smoother surface on rail reconditioned by welding and for removing rail corrugations.

In addition to these two grinders, there is also the Nordberg Heavy Duty Surface Grinder for surfacing welded rail ends and a variety of other rail grinding operations. With three types of grinders, Nordberg can furnish the machine best suited to each rail grinding job.

Nordberg Tools For The Maintenance Of Track

Adzing Machine	Power Jack
Rail Drill	Spike Puller
Power Wrench	Track Shifter

Three Rail Grinders

NORDBERG MFG. CO., MILWAUKEE, WIS.

No. 102 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Coming of Age

June 1, 1937

Dear Reader:

With this issue, Railway Engineering and Maintenance comes of age. In June, 1916, it first appeared as a separate magazine. It was the outgrowth of the Maintenance of Way Section of the Railway Age Gazette, a 24-page section included in the third issue of each month, beginning in May, 1911, with which was consolidated the magazine Railway Engineering and Maintenance of Way, which in turn had absorbed the Roadmaster and Foreman about five years previous.

In our first issue we stated that "rapidly changing conditions with respect to labor and materials and the increasing severity of the demands made on the track and structures combine to present new problems which must be solved. No one group of men can work out these problems unaided. The greatest progress can only be made through the co-operation of a large number of men and the free exchange of information and ideas. It will be the aim of Railway Engineering and Maintenance to assist in the dissemination of this information." In that first issue and in the 251 that have followed, we have endeavored to adhere to this platform and to bring to you a magazine that is not only helpful to you in your work, but interesting as well. We have tried to assemble the information that you desire and to present it in a way that will be easy to read. We hope that you look forward to the receipt of the magazine from month to month and miss it when it is delayed.

To the more than 7,500 of you who subscribe to Railway Engineering and Maintenance and to the far larger circle of readers with whom you share your copies we acknowledge a debt of gratitude for the co-operation, friendly advice and assistance that you have tendered us. This friendship has added greatly to the efficiency of our work. It puts us even more on our mettle than in 1921, to make Railway Engineering and Maintenance "thoroughly representative of the activities in the maintenance of way field and of the greatest value to our readers and to the railways that employ them."

In the 21 years that have elapsed, we have enjoyed a most happy relationship with you. We bespeak your co-operation that the next 21 years may be even more pleasant and more constructive for all of us—reader, advertiser and publisher alike.

Yours sincerely,

Elmer T. Howson

ETH:EW

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Hayes Type WD Bumping Posts with middle rails. These protect the ends of tracks at an ocean coal loading pier

The ordinary track is not strong enough to match the strength in a Hayes Type WD Bumping Post.

The addition of middle rails in such an installation is of the utmost importance in enabling you to get efficient service from the post. The track must be strengthened. These middle rails in a Hayes Post pass through sockets at the compression joints and are thus made a unit with the post.

The middle rails with the Hayes Type WD Bumping Post double the strength of the track and enable you to get full value from the strength of the post.

· Hayes Track Appliance Co., Richmond, Indiana

Guardians of Safety

TRUSCON WELTRUS HIGHWAY CROSSINGS

State Highway departments recognize that . . . in the interest of Safety First . . . Railroad highway crossings should be as smooth as the concrete highway that intersects the tracks. • A fundamental and unique feature of Weltrus crossing slabs is the pouring of the concrete into the welded steel units . . . each form combining both the necessary reinforcing and armoring. This is a reversal of the ordinary method of forming plain concrete slabs. • Weltrus steel sections completely armor the sides and ends of the concrete. In forming the flanges, the edges are protected with a rounded corner . . . an added protection against traffic impacts. • Wood flangeway blocks fit under the rail head, while the rib at the side of the blocks engages the groove in the side of the Weltrus section. When wood splines are driven between the center sections, the crossing is keyed between the rails. The creosoted wood splines form a continuous dowel pin the full length of the sections and carry the traffic loads from slab to slab. • With the continuous building of new and higher speed highways, smooth and permanent Weltrus crossings become a necessity. Complete detailed information is available in a new catalog. Send for YOUR copy NOW!

INVITATION

Be sure to visit the exhibit of Truscon Weltrus Highway Crossings at the Railway Supply Manufacturers' Association Exhibition, Atlantic City Auditorium, Atlantic City, June 16 to 23. Truscon Exhibit in Spaces 9E to 16E

TRUSCON STEEL COMPANY
YOUNGSTOWN • OHIO

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

June, 1937

Railway Engineering and Maintenance

Waterways

Do They Provide Cheap Transportation?

THE United States government has spent hundreds of millions of dollars to provide navigable channels on the Ohio, the Mississippi and other interior waterways. It is now spending many millions of dollars additional for the extension of these channels up the Mississippi, the Missouri and other streams. It is also spending still more millions of dollars for the maintenance of these channels in condition for navigation.

For what purpose are these expenditures being made? Are they justified economically? These are questions of direct public concern, for these expenditures are being made with public money. They are of interest especially to employes of the railways because of the traffic the waterways are designed to divert from the railways.

The Necessity

One of the arguments advanced by the proponents of the waterways is that they are needed to provide the capacity necessary to meet the transportation requirements of the country. In support of this contention they point to the car shortages and congestion that prevailed at times prior to and during the early days of the war.

These waterway advocates ignore, however, the great developments in facilities and in operating practices that the railways have made since 1920—developments that have provided a surplus of facilities constantly during the last 17 years, including the record years of 1928-29. The contention that the waterways are needed to move the nation's traffic is fallacious.

The other argument that is advanced in behalf of water transportation is that it is cheaper than rail transportation. In support of this position, attention is directed to the results of the operation of the Inland Waterways Corporation, an agency created by the government in 1924 to take over the operation of federal barge lines on the Mississippi and Warrior rivers and demonstrate the economic value of water carriers. This corporation has now been in operation for 13 years. It operates more than 325 barges, tow boats and other units of equipment on 3,150 miles of rivers and comprises an investment of more than $24,500,000. In 1936, it handled 1,856,514 tons of freight. Its operating revenues totaled $6,307,124. In that year its "net profit" was reported as $539,552, bringing the "net profit" for the 13 years, 1924 to 1936, inclusive, to $1,065,428, or an average of $81,955 per year. This is equivalent to an average annual return of only one-half of one per cent on the investment.

However, even this return, unfavorable as it is, is highly misleading, for it fails to take into account important items of expense that would accrue under private operation, including the taxes that any private concern would pay as its share of the cost of operating the government. If these taxes be taken at 6 per cent of the total operating revenues (the railways pay 7½ per cent) and if interest on the investment in the property be computed at only 4 per cent, the average "net profit" of $81,955 for the 13 years is converted into an average annual deficit of more than $700,000.

And this is not all, for the government is providing and maintaining at public expense the channels on which these barges operate. They are also the beneficiaries of municipal terminals, constructed at public expense and leased to the barge lines at rentals far below their carrying charges. They also receive free of cost office space in government buildings, free postage, relief from federal income taxes and other gratuities estimated to amount to $50,000 a year.

The Comparison

This, in brief, is the record of the federal barge line. If its operations were placed on a basis comparable with those of the railways, its costs would be such as to require rates higher than those now charged by the railways. If to this be added the further considerations that (a) the barge line is equipped to handle only certain commodities, (b) that its operations are much slower than by rail, (c) that it is forced to suspend operations on northern streams for several months during the winter, and (d) that such advantages as it posseses are confined largely to industries located directly on the streams, the conclusion is inescapable that the barge line is an economic failure whose continued operation results only in (1) adding to the burden of the taxpayer at large for the benefit of the few shippers who are so situated as to be able to utilize the service and (2) diverting from the railways a volume of traffic which would add materially to their earnings and enable them to improve their service to the country at large.

In view of the widespread belief that water transportation is low in cost, from its very nature and the further fact that much misleading if not absolutely inaccurate information is being disseminated through official or semi-official agencies, a responsibility rests upon railway em-

ployes to correct these erroneous impressions and to disseminate the facts, to the end that public expenditures for waterway transportation be limited to those channels where true economy can be demonstrated and that further uneconomic inroads on railway traffic be stopped.

Safety

Are You Keeping Up the Campaign?

THE railways offer by far the safest passenger transportation; their record in the reduction in casualties to employes is also an enviable one. Yet according to opinions expressed at the recent meeting of the Safety section of the Association of American Railroads, further reductions in the accident rate demand extraordinary measures. The fact is that both the number of employes killed and the number injured in 1936, per million man-hours worked, were greater than in 1935. The death rate last year per million man-hours worked, 0.259, compares with 0.241 in 1935, and 0.230 for both 1933 and 1934, and was greater than for any year since 1930. Likewise, the number of persons injured per million man-hours in 1936 was 8.46, compared with 7.11 in 1935, and was the highest rate since 1930.

A breakdown of the 1936 figures that would show the casualty rates for different classes of employes is not yet available, but it is evident from a comparison of the casualty rates for the principal classes of maintenance of way employes throughout 1933, 1934 and 1935 that no improvement was made during those three years, taking the railroads as a whole, in reducing the accident rate. As a matter of fact, the rates for bridge and building carpenters, section foremen and extra gang laborers were higher in 1935 than in 1933.

Some measure of the accident record for maintenance of way employes in 1936 is afforded by the fact that the number of employes, other than train service employes, who were struck or run over by trains totaled 190, the highest rate since 1931. A further index is given by the record for accidents other than train accidents or train service accidents which, of course, embrace the majority of the mishaps in which maintenance of way employes are involved. Accidents of this group involved 12,984 employes (both killed and injured) in 1936, compared with 9,670 in 1935 and 9,171 in 1934.

It is well known that the number of accidents varies with the volume of traffic, not only because the risk, as far as train and train service accidents is concerned, varies with the number of trains run but also because the employment increases with business. Of course, the use of the million man-hour basis eliminates the latter variable in making comparisons, but even so, the record for the last four years is one that is giving concern to all thoughtful railway men.

Various explanations have been offered for the poor showing of the last year. T. H. Carrow, superintendent of safety of the Pennsylvania, inclines to the opinion that it is due to the fact that laxness among the employes is condoned when supervising officers are too busy with increased work to make certain that men are observing the safety rules. Obviously, it is up to every officer to decide for himself whether this statement is true so far as he is concerned and make amends immediately.

Another factor that must be considered is the influence of a larger proportion of new and untrained employes, during times of increased activity. This was discounted by one safety officer who declared that it is the old men who are now getting hurt because they are more reluctant than younger men to adopt improved practices. However, this observation is not applicable to such forces as extra gangs, the complexion of which has been changing rapidly during the last year or two. Instead of being composed of track men who return to this class of work year after year, the extra gangs of today are being recruited more largely from groups that have had no previous experience in track work.

This imposes a double duty on the foremen and supervisory officers, for these inexperienced men must not only be trained to do work in which they are unskilled, but must also be schooled to protect themselves from injury. In their anxiety to get work done, it is easy for a foreman or supervisor to overlook the urgent need for thorough instruction in safety. But as the statistics indicate, it is not alone the extra gang forces that need attention in this regard. Experience has shown that a railroad with an excellent safety record can easily lose its high rating whenever any laxness in the vigilance to prevent accidents is allowed to develop.

Dating Nails

Is There any Advantage in Continuing Their Use?

IN THE early days of preservative treatment, the use of dating nails was widespread as a means of getting reliable information on the service life of both treated and untreated ties. At that time few questioned their use, but as information accumulated demonstrating the economic value of preservative treatment, a number of roads discontinued using them on the ground that since there was no longer any question as to the economy of timber treatment, further information of this kind was unnecessary, and it was possible to save the cost of the nails, amounting in some instances to as much as $12,000 to $15,000, or even more, a year. Yet today, despite the recognized value of preservative treatment, not a few roads are continuing the use of the nails.

Among those who have discontinued the use of dating nails, some officers take the position that since all of the ties in service on their roads are now treated, their average life can be obtained easily from data covering annual renewals. Others depend on special test sections for the essential information they desire and consider that dating nails on the remainder of their ties are unnecessary.

Recently, the practice has been adopted on some roads of stamping certain information, including the date of treatment, on the ends of the ties as they pass through the adzing and boring machines. This is cited as serving the same purpose as the dating nails, and much cheaper, although it does not necessarily show the date of installation.

However, both observation and experience indicate that dating nails, whatever value they may have for pur-

poses of record, also have a value that is related only indirectly to their function as a basis for the record, and that is entirely out of proportion to their cost, for the use of dating nails tends to give the ties a standing in the eyes of foremen and tie inspectors which undated ties do not have and can never attain. Branded ties are not much more impressive in this respect than undated ties, since the marks are covered with ballast which must be removed before they can be seen.

Not a few maintenance officers have remarked that ties bearing dating nails are rarely removed until they have failed, or are actually at the point of failure, but that many undated ties are taken out a year or two before their service life has been completed. Obviously, if even one additional year of service can be obtained through the use of a dating nail, the purchase of the nail will represent a sound investment.

A Labor Shortage

Is It Impending? How to Counteract It

FOR maintenance of way officers to be confronted with a labor shortage when the rate of business activity is still substantially below pre-depression levels and when there are millions of men still "on relief" is a strange anomaly, but it is a fact. In certain localities the railroads are having not a little difficulty in obtaining sufficient satisfactory labor to fill out section and extra gangs; in some instances they are also experiencing similar difficulty in obtaining bridge and building labor.

The reasons for this situation are quite apparent. Most important among them is the fact that the federal government, through its work relief projects, is in direct competition with private industry for the services of unskilled, semi-skilled and, in some cases, skilled labor. Maintenance of way work, being now largely seasonal in character, has the disadvantage that much of the employment which it provides is of a temporary nature. For this reason workmen engaged on WPA projects are loath to give up their positions to accept employment in private industry when the length of that employment may not exceed a few months at the most, even though the hourly rate of pay may be higher. This situation has resulted in artificial curtailment of the available supply of labor in many localities.

Another factor which is operating to attract labor away from the railroads arises out of the increased rate of activity in certain industries, such as steel making, which require large amounts of unskilled and semi-skilled labor when business, as at present, is maintaining a fairly active pace. Here again, prospects of relatively permanent employment, combined with higher rates of pay, have served to place the railroads at a disadvantage in bidding for available labor. But the effects of this situation are in large measure confined to the highly industrialized districts, while that resulting from WPA competition reaches to all parts of the country.

While the tight situation in the labor market probably will not become so severe as seriously to restrict maintenance programs this year it has promise, because of increasing business activity and the reluctance on the part of Congress to restrict relief outlays, of becoming a problem of considerable magnitude in the not distant future. What, then, can the railroads do to assure themselves of an adequate supply of labor under such conditions?

They can, of course, seek to prevail on the government to curtail its work relief activities where they bring public works projects into competition with private enterprise for available labor. Because of political considerations, however, it is questionable whether this approach to the problem offers much in the way of a solution.

More positive results can be accomplished by (1) further reducing the importance of man-power as a factor in maintenance of way work, (2) returning more largely to the pre-depression practice of distributing the work to provide more all-year-round employment, and (3) increasing the attractiveness of maintenance work as a form of livelihood. It is true that the railroads have made considerable progress in recent years in mechanizing their maintenance of way operations but in not a few instances tasks for which power equipment is now available are still done by hand. The railroads, therefore, can in some measure alleviate the effects of a shortage of labor by planning the utilization of power devices on a more intensive and extensive scale.

As regards year-round work, numerous roads made marked progress in stabilizing forces during the boom years, but many of these methods have fallen by the wayside during the last six or seven years of large surpluses of labor. Much can be done, as before, to reduce the seasonal peak demand for men and add also to the desirability of maintenance work.

There also remain possibilities for making maintenance work more attractive through further improvement of working conditions. Under this heading the housing of labor is an important factor. The recently adopted practice on one road of providing extra gangs with specially-equipped bath cars is an example of what can be done in this direction.

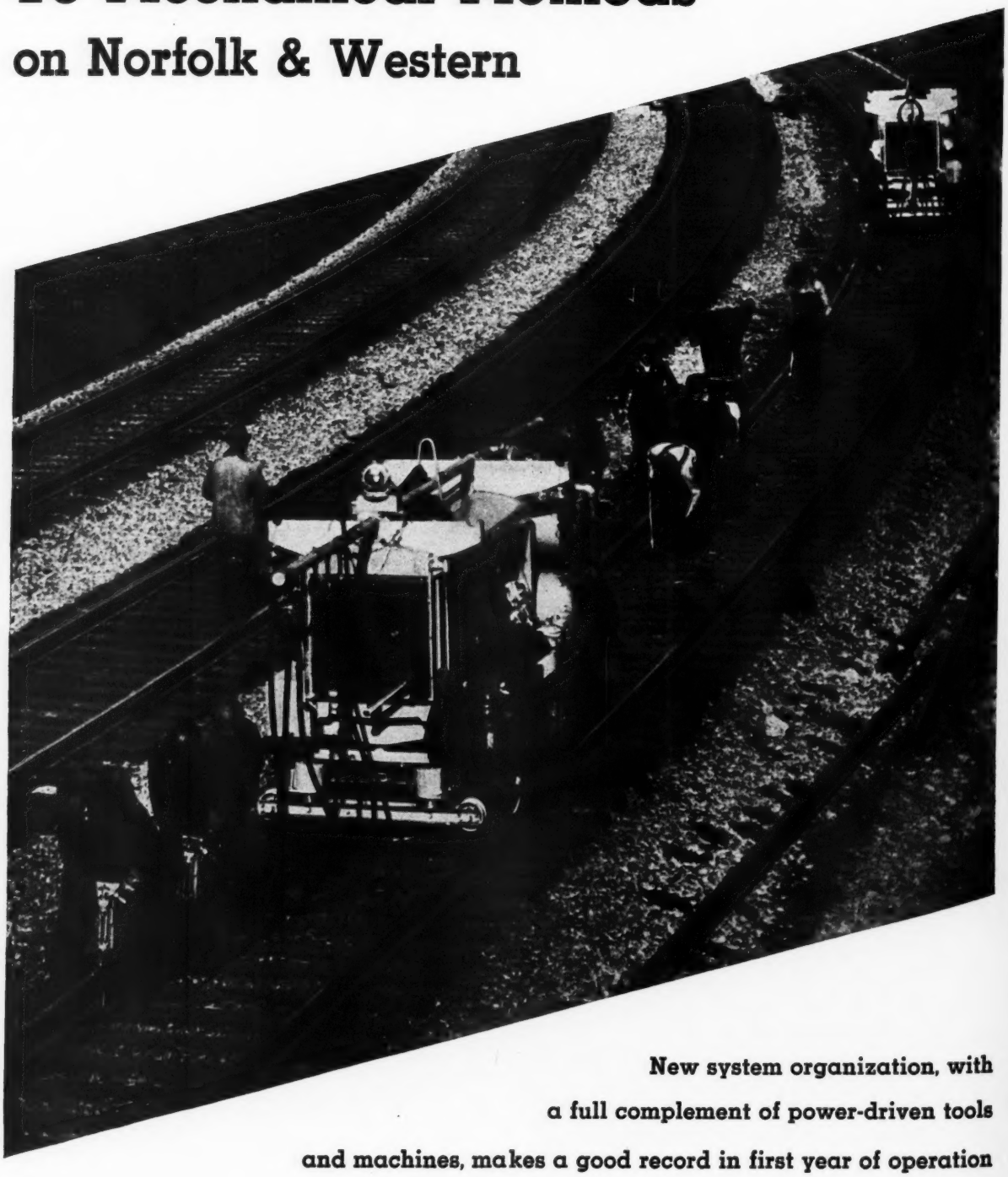
It behooves the railroads to take steps now to protect themselves against the more severe shortage in the labor market, which, with further improvement in business activity and continuance of present government policies in regard to work relief, is certain to occur.

Rail Renewals

Three Articles on Methods and Appliances

WITH more than a million tons of rails delivered or under order with the mills for laying during the present season rail renewals will loom larger in the activities of the maintenance of way departments of American railways this year than in any year since 1930. Not only the economy with which this work is done but also the quality of the result will depend on the methods pursued. For this reason we present on following pages detailed accounts of the organization, procedure and equipment employed on three different railroads. We feel that the facts brought out in these articles are not only timely but should be of assistance to those who are responsible for the conduct of this important work.

Manual Rail Laying Gives Way To Mechanical Methods on Norfolk & Western



New system organization, with a full complement of power-driven tools and machines, makes a good record in first year of operation

DURING the last two years, the Norfolk & Western has completely mechanized its rail-laying operations, and although its experience with its new equipment is still limited, it is already accomplishing results which appear highly satisfactory as regards both quality and production. Viewed in the light of what has already been done by certain other roads in the way of mechanized rail-laying operations, there is little new or novel about the N. & W. organization or methods, but, on the other hand, both the organization and methods adopted are somewhat unusual in their completeness and effectiveness.

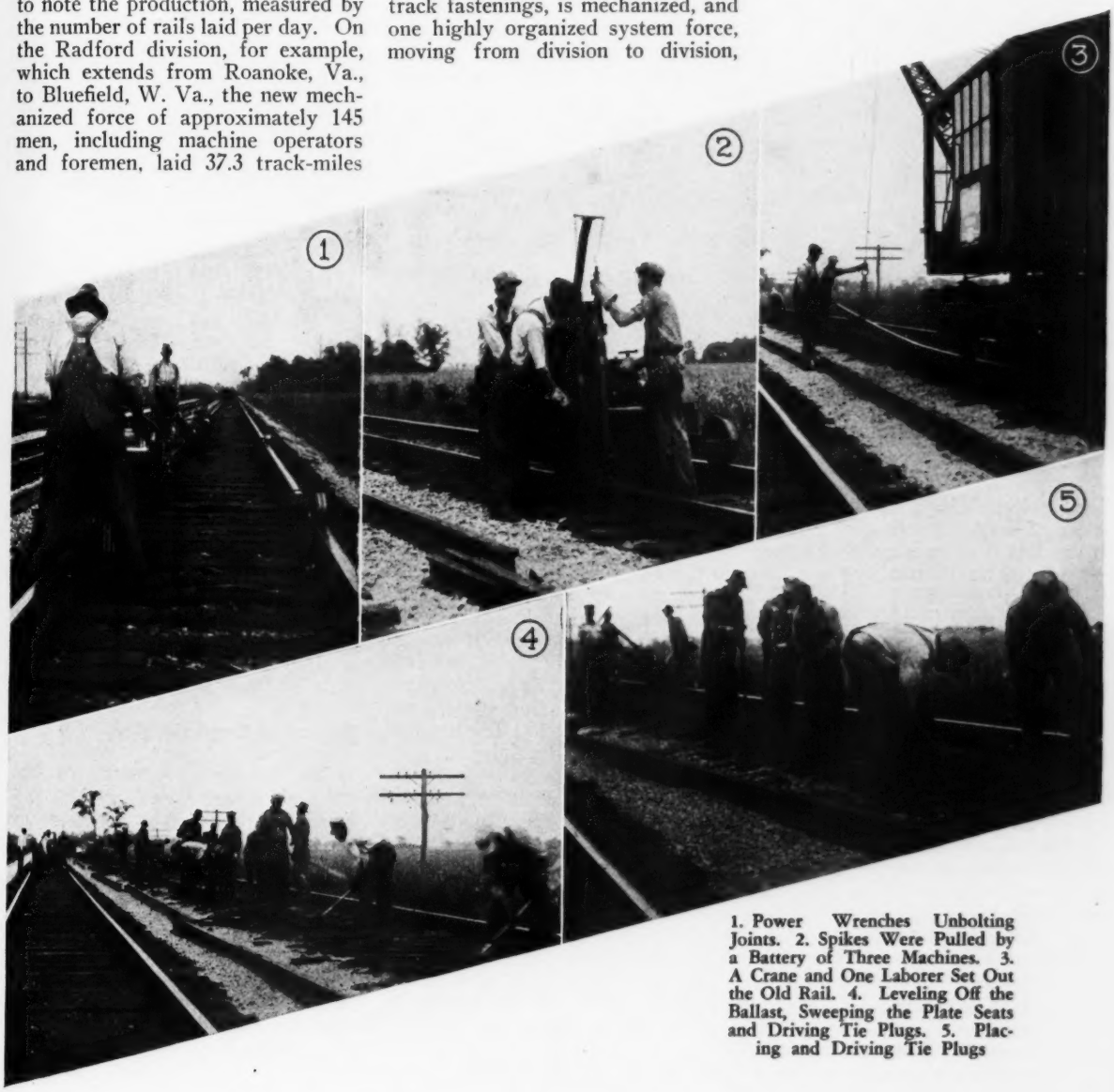
Speed, as such, has been and continues to be of secondary importance in the rail laying work on this road, stress being laid primarily upon the quality of the work. In view of this attitude, it is particularly interesting to note the production, measured by the number of rails laid per day. On the Radford division, for example, which extends from Roanoke, Va., to Bluefield, W. Va., the new mechanized force of approximately 145 men, including machine operators and foremen, laid 37.3 track-miles of rail and 55 turnouts in 19½ working days, an average of 518 rails and 2.8 turnouts per day of approximately 10 hours. The greatest daily production in this period, reached near the end when conditions of weather and traffic were particularly favorable, was 631 rails and 4 turnouts renewed in approximately 10 hours.

System Gang

As recently as 1935, the rail-laying crane was practically the only unit of work equipment employed in laying rail on the road. Each division laid its rail by bunching section and extra gangs, while other work was temporarily delayed. Today, practically every operation in rail renewal work on the road, from the distributing of the new rail to the picking up of the released rail and track fastenings, is mechanized, and one highly organized system force, moving from division to division, handles all program rail renewals.

Through the change which has been made, over-all production costs have been reduced; the quality of work has been improved in many respects through the greater skill of the more experienced force and the greater accuracy of certain of the machine operations; and the entire year's rail-laying program is being handled more effectively and expeditiously, leaving the greater part of the summer working season available for general track work, including tie renewals, ballasting and surfacing.

In spite of the fact that it is only a matter of months since rail-laying operations on the Norfolk & Western have been fully mechanized, it is not to be assumed that the standard of track maintenance on this road has



1. Power Wrenches Unbolting Joints. 2. Spikes Were Pulled by a Battery of Three Machines. 3. A Crane and One Laborer Set Out the Old Rail. 4. Leveling Off the Ballast, Sweeping the Plate Seats and Driving Tie Plugs. 5. Placing and Driving Tie Plugs

not been high, nor that the performance of track gangs has been anything but efficient. On the contrary, this road, with its 2,763 miles of line and 4,516 miles of tracks, has concentrated over the years upon building up one of the most substantial roadbed and track structures in the country, including a deep stone ballast section; sound treated ties; heavy tie plates, lagged to the ties with cut spikes, independent of the rail; and rail of 130 or 131-lb. section. As far back as 1911, 100-lb rail was standard on the road, being changed to the 130-lb. section in 1920, and to the new 131-lb. R.E. section in 1933.

That this constant strengthening of the track structure, together with more efficient gang organization, has been reflected in reduced maintenance of way expenditures, is seen in the fact that man-hours of labor per mile of track maintained on the road have decreased consistently since 1923, until in 1935 they were only approximately one-half of what they were in 1923, in spite of the fact that in the later year, traffic was somewhat greater than in 1923.

6. Three Power Adzers Prepare the Plate Seats. 7. Swabbing Newly Adzed Tie Plate Seats With Creosote

Change Made in 1936

Prior to 1936, as already mentioned, all rail-laying operations on the road were carried out by division forces, including usually from 45 to 60 men, without power tools or units of work equipment other than cranes in certain instances. Early in 1936, with the view of improving the quality of the work and of reducing costs, while at the same time minimizing the strenuous physical effort required in many of the various rail-laying operations, the road purchased its first units of rail-laying equipment. Later in the year, as the men became familiar with these machines, and the machines demonstrated their worth, additional purchases were made, with the aim of developing one fully mechanized system rail-laying organization.

By the end of 1936, all equipment necessary to fully-mechanized rail-laying operations was at hand and a definite organization had been set up to carry out the 1937 rail-laying program. Under this program, it was planned to move the rail-laying organization from division to division, completing at one time all of the major rail renewal operations on each division before moving to the next. The 1937 work was started on the Norfolk division, at the east end of the road, on March 2, and has since been continued progressively westward. At the present rate at which the work is progressing, it is expected that the year's entire new-rail program, including 40,000 tons, or approximately 190 track miles, will be completed by July 15.

To appraise accurately the operations being carried out and the results being accomplished by the present mechanized rail-laying organization, it should be understood that all rail renewals involve the renewal of tie plates as well as rail, and out-of-face adzing of the ties. This complete stripping of the track has been occasioned by the fact that in this year's program, rail of the 131-lb. R.E. section, with a base width of 6 in., is replacing largely 130-lb. P.S. rail, which has a base width of 5½ in. In connection with the change in rail section, double-shoulder tie plates, 13½ in. long by 8 in. wide, with either flat or compression-type bottoms, are replacing smaller tie plates of a different bottom design, and six-hole, 100-Per Cent joint bars of the head-contact type are being used in place of four-hole bars of the Continuous type. All of the new rail is being bonded with short, plug-type signal bonds applied to the outside of the head, and the rail itself is fully anchored with anti-creepers of various types.

All of the work is carried out without direct interference of traffic, as full use of the track is obtained during the working hours. However, upon the completion of the work each day, the track is restored to service without speed restrictions. In this connection, it is of interest to note that, insofar as possible, all worn rail and track fastenings are picked up the same day as released, this being done by a small force supplementary to the main rail-laying organization, aided by cranes with rail tongs and magnets.

Balanced Organization

The rail-laying force consists of 145 to 150 men, including the roadmaster or assistant roadmaster on the territory involved, who is in general charge, the work equipment operators, and the rail-laying gang foremen. The work is usually spread out over a distance of three quarters of a mile to a mile while in full swing, and both rails are renewed to the same point each day, the gang dropping back during the latter half of the scheduled working hours to bring up the second rail. Keeping

the force well spread out prevents interference between groups carrying out specific operations, in spite of any minor fluctuations in the speed with which the various operations may progress.

While the specific make-up of the rail-laying organization is varied somewhat throughout the working day, and especially during the starting and closing-up operations, and while renewing turnouts, the general organization during the major part of the day while laying continuous stretches of rail, is essentially as shown in the accompanying chart. From the first operation shown, it will be evident that it is the practice on the N. & W. to uncouple the rails while in track and to set them out one at a time. This operation includes the removal of all bolts from the old four-hole joints, which work is done by two men, each equipped with a gasoline - engine - powered track wrench. The wrenches employed, which have two speeds and high starting torque, have practically no difficulty in removing the nuts, regardless of their tightness. Only infrequently is it necessary to burn off a bolt because it cannot be removed readily otherwise.

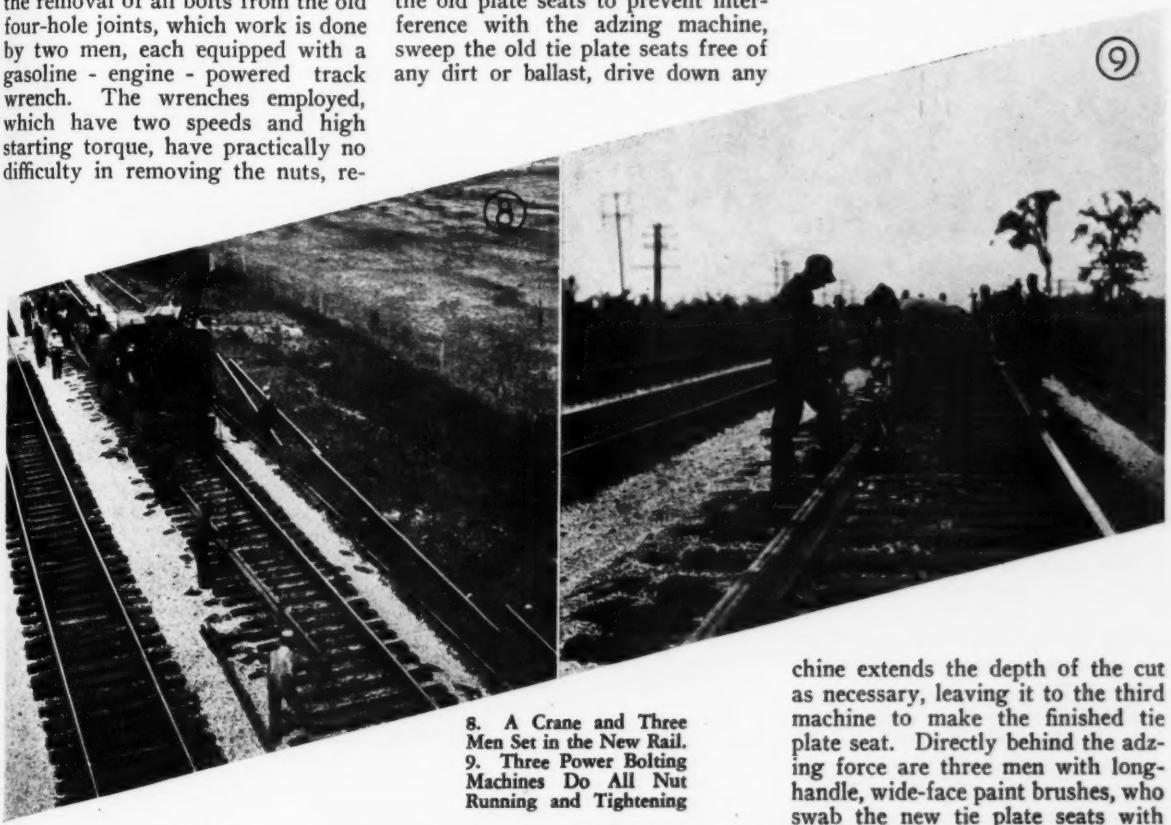
The unbolting machines are accompanied by three laborers who remove the old bond wires and rail anchors. Following these operations comes a battery of three power spike-pulling machines, each operated by three men, and each pulling the spikes continuously from every third tie, on both sides, before moving ahead. Accompanying these machines are two additional laborers equipped with clawbars, who pull the spikes at rail joints, and any other spikes which cannot be gripped readily by the machines.

Crane Sets Out Rail

The next operations involve the setting out of the old rail, the removal of the old tie plates, and the plugging of the old spike holes with treated tie plugs. The setting out of the rail is done with a 3½-ton gasoline-operated rail crane, and involves the labor of only one man in addition to the operator, who adjusts the rail tongs on the rail.

Immediately following the removal of the old rails, a group of 17 men remove the old tie plates, level off the ballast between the ties opposite the old plate seats to prevent interference with the adzing machine, sweep the old tie plate seats free of any dirt or ballast, drive down any old spike stubs which might cause damage to the cutting blades of the adzing machines, and plug all spike holes with tie plugs. It is of interest to note that the handles of the brooms employed by this force are equipped with shovel-steel blades, about 4 in. by 6 in., which are used as rakes in lowering the surface of the ballast, and also that the driving of the tie plugs is done with a ramming type of tool, which permits the operator to stand in an upright position and insures that the plugs will be driven straight into the tie and to the full depth of the spike holes.

Close behind these preparatory operations comes a battery of three power-adzing machines, each operated by one man, but, as a group, assisted by six laborers employed essentially in the sharpening of the knives of the machines, dismantling and assembling the cutting heads, and carrying the heads to and from a grinding car coupled behind the rail-laying crane, where the sharpening operations are performed. In the adzing operations, all three machines move progressively from tie to tie, each touching the tie to some extent, depending upon its condition. The first machine is so operated that it catches only the projecting tops of the tie plugs, while the second machine extends the depth of the cut as necessary, leaving it to the third machine to make the finished tie plate seat. Directly behind the adzing force are three men with long-handle, wide-face paint brushes, who swab the new tie plate seats with creosote, and five other men who set the new plates in position.



8. A Crane and Three Men Set in the New Rail.
9. Three Power Bolting Machines Do All Nut Running and Tightening

The setting in of the new rails is done in the usual manner with a rail crane, assisted by three laborers who direct the rails into proper position on the tie plates, the rear end of each rail having joint bars loosely attached by three bolts. This advance application of the bars, done to simplify the work of the rail-laying force, is taken care of by the material-distributing gang, as will be pointed out in greater detail later.

Following the placing of the new rail, eight men, with three power

bolting machines, apply the additional bolts required at each joint, together with the joint springs or coil spring washers used, and then tighten all nuts. In carrying out the machine bolting, the first of the three machines, operating in high gear, runs up to a snug fit the three nuts on the inside of each joint. The second machine, also in high gear, then runs up the nuts on the outside of the joints, while the third machine, operating in low gear, gives the final turns to all nuts to produce a uniform bolt tension of 18,000 lb. In connection with the application of the bars and the bolting, care is exercised to see that the bars are drawn up to a tight fit in the head fishing at the center, this being accomplished by driving the bars in at the center of the base.

Directly behind the bolting operation, three laborers adjust the tie plates as necessary to insure full seating of the rail, and then four groups of gagers, each including three men, gage and spike the rails at joints, centers and quarters.

Power Spiking Throughout

Full spiking of the rail, including the driving of the lag spikes holding the tie plates to the ties, follows immediately after the gaging, and is done by two separate gangs, working, however, in close relationship with each other. The first gang, which includes nine men tapping in spikes with short-handle mauls and six additional men with pneumatic spike drivers who drive the spikes, sets and drives only the line spikes. The second gang, of the same size, following closely behind, then sets and drives all of the lag spikes.

When rib-bottom plates were used on the road, lag spiking was delayed for several weeks after the laying of new rail to permit the initial seating of the plates in the ties before spiking. With the flat or compression-bottom-type plates now being used, initial settlement of the plates during the first few weeks of traffic is inconsequential, permitting the lag spiking operations to proceed directly in connection with the rail renewal work.

Air for the operation of the spike drivers is furnished by two flange-wheel-mounted, self-propelled, two-stage air compressors, each with an air delivery capacity of 315 cu. ft. per minute at 100 lb. pressure. Six drivers are employed ordinarily with

10. Drilling for the New Plug-Type Signal Bonds. 11. Cranes With Tongs and Magnets Pick Up the Old Material the Day It Is Released

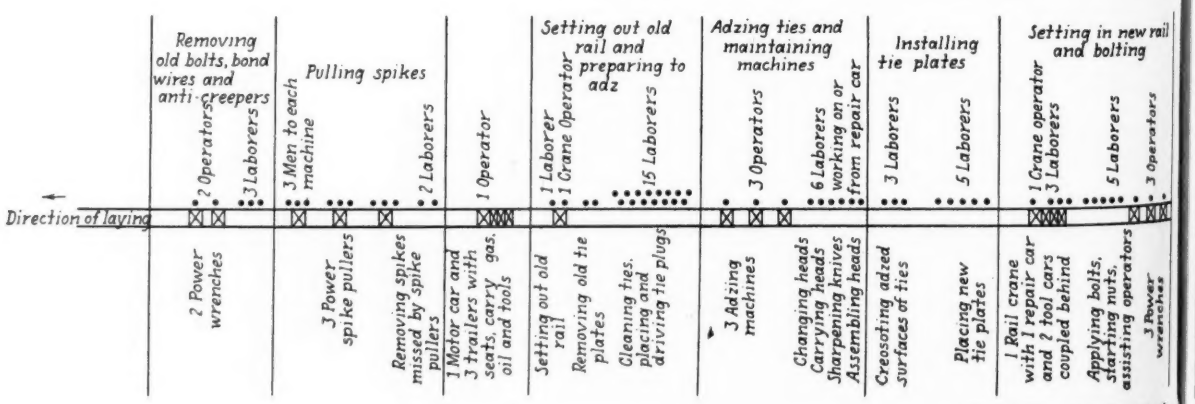


Chart Showing Organization

each compressor in single-spike territory, but on curves, where either one or two additional line spikes are employed, additional spiking hammers are added to each organization as necessary to keep their progress abreast of the other rail-laying operations.

In the spiking work, it is insisted that all spikes be driven vertically and that all line spikes be driven close to the rail. Where for any reason this is difficult or impossible with the power hammers, the spikes are skipped by the hammer-men and are driven immediately behind by four men with mauls. These latter men also straighten or redrive any spikes driven imperfectly, and square up any plates which may have become skewed during the spiking operations.

With the rail full-spiked, the only work remaining includes the application of anti-creepers, six or more to the rail as may be necessary under the conditions existing, the application of signal bonds and the installation of insulated joints. The application of anti-creepers is handled by two men, while the signal work is carried out by two signalmen and three laborers, equipped with two power bonding drills, and having access to either of two power track drills, kept with the rail-laying organization for any bolt-hole drilling that may be required.

Rail Ends Conditioned

While the anchoring and bonding of the rail complete the operations carried out by the rail-laying organization, except for the picking up of the material released, which will be mentioned later, it is interesting to note that supplemental operations on the rail to prevent damage to its ends under traffic include cross-slotting, and surface grinding of the ends to remove mill tolerance in height. Since early 1936, most of the rail laid has had its ends hardened at the mill. The supplementary operations on the new rail are delayed for a period after the rail is laid, in order to permit full adjustment of the track under traffic.

In addition to these operations, it is the practice of the N. & W. to surface all new rail as promptly as possible after it has been laid to prevent posible damage to it because of any uneven support on the roadbed. With many large power tie-tamping gangs on the road, this practice is carried out effectively, and, when the work is completed, along with the conditioning of the rail ends, the road is assured that it has track which can take the severe punishment of heavy traffic for a period of at least three or four years, with a minimum of attention or maintenance expense.

Cleaning Up

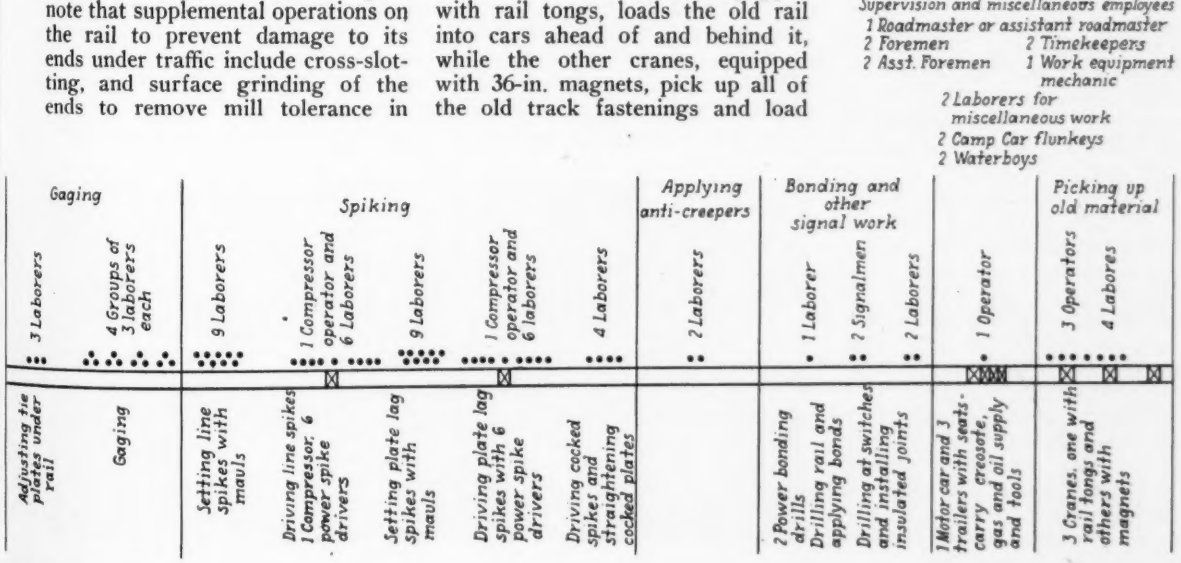
All of the old rail and track fastenings released in the rail renewal operations are picked up the same day as removed from the track unless this is prevented by some unusual circumstance. This is done by a work train operating within the same stretch of dead track as the rail-laying organization, so that there is minimum interference to traffic and to the operations themselves.

The equipment employed includes essentially three cranes of either the locomotive type or the crawler-mounted type operated on flat cars, and the force employed is usually confined to four men in addition to the three crane operators and the train crew. One crane, equipped with rail tongs, loads the old rail into cars ahead of and behind it, while the other cranes, equipped with 36-in. magnets, pick up all of the old track fastenings and load them into gondola cars immediately adjacent. The man assisting the rail crane operator adjusts the rail tongs on the rails to be loaded, while the other men pile the track fastenings near each joint in position to be picked up by the magnets. No attempt is made to classify any of the material, including the rail, which is merely marked with paint to indicate whether it is No. 1, No. 2 or No. 3 relayer, or scrap. Sorting of the rail and the classifying of all the old track fastenings are done at the system maintenance of way material supply yard at Roanoke, Va.

Maintenance Supply Yard

No description of the new rail-laying methods on the N. & W. would be complete without reference to the care exercised in distributing the new rail and track fastenings in advance of the rail-laying operations, and the important part played in this regard by the system maintenance of way supply yard previously referred to. The main point of interest in this regard is that when the rail-laying organization moves on to a section of track to be relaid, everything is in readiness, and through the aid of the supply yard, it can be assured that all materials necessary are on hand.

The Norfolk & Western maintenance of way supply yard was described in *Railway Engineering and Maintenance* for June, 1932, so that reference here will be confined primarily to its functions in connection with rail-laying operations. Through this yard pass all maintenance of way materials employed on the system, with the single exception of



of the Rail Laying Gang

rail, and to this yard are returned all released materials, including rail, for classification, reclamation or scrapping.

The yearly rail-laying programs on the road are set up by the divisions through their assistant superintendents (who are in charge of track maintenance), and the division superintendents, and are checked and approved by the different general superintendents and the general manager. The supplying of all materials for these programs is, however, handled by the chief engineer and his staff. Being advised of the approved rail-laying programs of the different divisions, the chief engineer sees that the necessary materials are on hand at the time required, all of these materials, with the exception of new rail, being routed through the system maintenance of way supply yard. New rail is routed direct from the mills to one of two terminal points on the road, from which it is reconsigned to the headquarters of the various roadmasters on whose territories it is to be laid.

When the chief engineer has been advised of the date, place and amount of rail to be laid on any division, he arranges for the necessary amount of rail to be on hand, and his staff carefully calculates the quantity of track fastenings required. A bill of materials is forwarded to the supply yard at Roanoke, and it is then up to the yard to see that every piece of material ordered is at the site of the rail-laying operation in sufficient time to permit careful unloading and distributing before the arrival of the rail-laying organization.

Materials Carefully Loaded

Through the facilities and organization at the yard, this obligation is handled in a routine manner, yet with such accuracy and despatch that there is only commendation of the system yard arrangement among the track forces. When materials are needed on the line, no obstacles are permitted to interfere with having them on hand at the time specified. Furthermore, all materials are loaded separately in cars to simplify unloading, even to the grouping of parts for turnouts of various numbers, so that no sorting or rehandling is necessary in the field to get at all of the pieces required at any point. Furthermore, where new frogs, switches or guard rails are ordered, they are sent out complete, with bolts, fillers, plates, etc., tied or wired to the larger pieces to insure that no parts will be missing when delivery is made on the divisions.

For the 37.3 track miles of rail and 55 turnouts renewed in the rail program on the Radford division, referred to earlier in this article, the maintenance of way department yard forwarded 117 carloads of material, supplementing the 139 carloads of rails which came direct from the mills. Without exception, all of this material was received in ample time for orderly distribution in advance or the scheduled rail laying, and in no case was there a shortage of materials of any character, including the many special parts in the 55 new turnouts.

Rail and track fastenings invariably arrive on the divisions several days in advance of the rail-laying organization, permitting the roadmaster ample time to arrange for a work train for distributing them. Wherever posible, both the rail and fastenings are distributed at the same time, although where long stretches of rail renewals are involved, separate work trains are sometimes used for handling the rail and fastenings. In either case, the rail is lined up carefully in the intertrack space and along the outside shoulder, end to end, to avoid carrying during the renewal operations; short rails are set off as necessary in curved-track territory to permit the continuance of staggered joints, with minimum cutting in the field; all rails are measured and the center points are marked with keel to insure quick and accurate spotting of the rail tongs during setting-in operations; and all turnout materials are unloaded at points most convenient to the renewal operations.

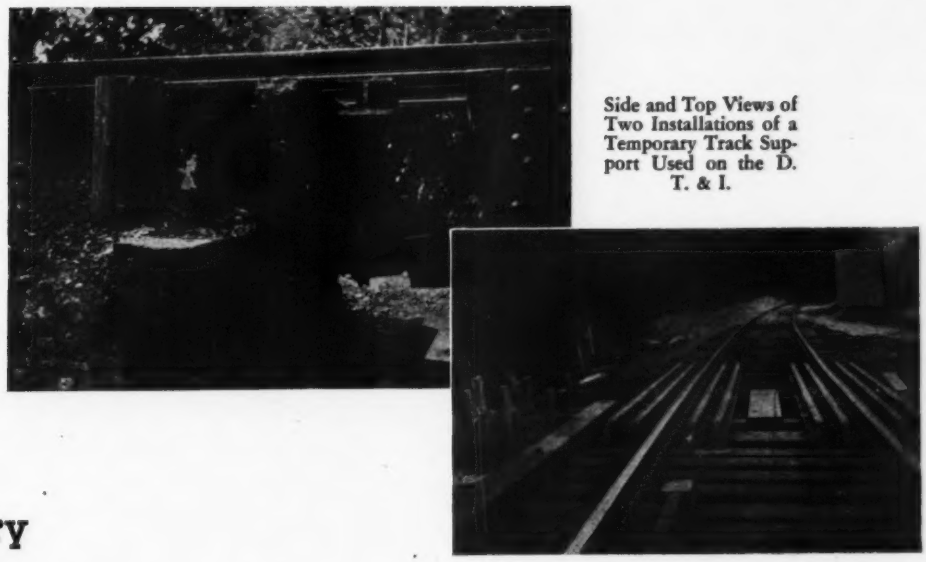
At the same time, joint bars are thrown off at each new joint location and are applied loosely with three bolts to the ends of the new rails; joint springs, or washers, and the three additional bolts required at each joint are laid near the locations of the new joints; and the plates, tie plugs and spikes for each tie are distributed through the center of the track, along with the number of anti-creepers specified. As a further assistance to the rail-laying organization, the center points of all of the old rails in track are marked so that they can be picked up in proper balance with one grab of the tongs.

The system rail-laying organization, being essentially a large floating gang, is housed in a camp train of 31 cars. This camp is moved from place to place as the scene of operations changes, and the men are conveyed between the camp and the various points of operations on two heavy-duty motor cars, each of which is equipped with three large trailers. These motor cars and trailers form a permanent part of the rail-laying organization equipment.

The N. & W. is reluctant to discuss rail-laying production with its new mechanized organization, its first consideration being quality work to insure securing the maximum life from the rail, with minimum routine maintenance costs. However, the record of accomplishment of the new organization during the first half of this year's program shows that it has had no difficulty in laying as much as two track-miles of rail, involving 542 rails, in a 10-hour day, and has frequently exceeded this amount (reaching a maximum of 631 rails, in addition to 3 or 4 turnouts, on several days). Wherever production has been less than two track miles a day, the work has involved the renewal of from one to five turnouts, and almost invariably has been further affected adversely by such unfavorable influences as inclement weather, limited working time, or very heavy traffic.

The system mechanized rail-laying organization on the N. & W. was developed under the direction of J. R. Derrick, assistant to the general manager, and W. P. Wiltsee, chief engineer.

One of 12 Grade Crossings on the Niagara Junction Railway Illuminated with General Electric Sodium Luminaries



Side and Top Views of Two Installations of a Temporary Track Support Used on the D. T. & I.

A Temporary Track Support of Unusual Design

FOR carrying the track rails across excavations 5 ft. or less in width without resorting to the use of conventional timber falsework, the Detroit, Toledo & Ironton utilizes a type of temporary support that embodies a number of unusual features. In this support each track rail is carried by four new 90-lb. rails 16 ft. 6 in. long, two on each side, which extend across the excavation and rest on the track ties on each side, the load being transferred from the track rail to the supporting rails by means of one or two (depending on the width of the excavation) transverse needle beams, each of which consists of a 6-in. 80-lb. H-beam, 3 ft. long.

Each needle beam is suspended from the supporting rails by means of four 1¼-in. by 13-in. bolts, two at each end, which extend through holes in both the upper and lower flanges of the H-beam. Where it protrudes through the lower flange of the H-beam, each bolt is fitted with two hexagonal nuts and a cotter key. The upper ends of each pair of bolts, which have square heads, extend through a 6¾-in. by 3-in. by 9-in. steel block which spans between the bases of the two supporting rails. To provide a full bearing on the rail bases, the under surface of the block is beveled.

The supporting rails comprising each pair are placed 6¾ in. apart, in the clear between webs, while the distance from the center of the track rail to the center of the nearest supporting rail is 8-5/32 in. Each pair of supporting rails is tied together by four 1-in. by 9½-in. spacer bolts, each of which is inserted through holes in the webs of the rails and through a 1¼-in. by 6¾-in. pipe spacer between the rails. A spacer bolt is placed 1 ft. 3 in. from each end of the rails while the other two are inserted at points 3 ft. 6 in. from the end bolts. The outside flanges of each pair of rails are spiked to the track ties.

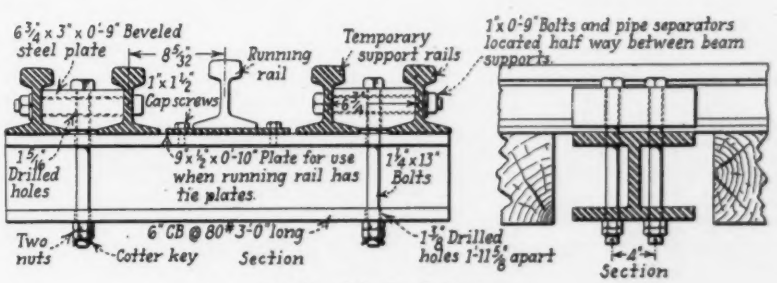
Use of Shims

Where the track is tie plated, it is necessary to raise the support for the rail above the top of the H-beams by means of a shim, consisting of a 9-in. by ½-in. by 10-in. steel plate, which is fastened to the top flanges of each H-beam by four ½-in. by 1½-in. cap screws. When the temporary support assembly is installed at locations where the track is not tie plated the H-beams are inverted so that the track rail rests directly on the beams.

In order that dragging equipment will not impinge on the ends of the support rails, 1-ft. sections at each end are curved downward on a radius of 24-in. It is required that these rails be supported on at least two track ties, and preferably three, on each side of the excavation and that the top of the running rail shall in no case be below the tops of the support rails. Where this support is used, the walls of the excavation are protected by temporary sheeting while a temporary tie is inserted in the track at each edge of the excavation.

This rail support is used for spanning excavations having a maximum width of 5 ft. where the track is subjected to an E70 live load plus an impact load of 50 per cent. Where the excavation consists of a narrow trench, only one of the needle-beams is employed; for wider excavations two are used. The D. T. & I. has found this rail support to be particularly effective when placing concrete in the back walls of abutments where the concrete extends to the undersides of the ties.

The type of track support described in the foregoing was devised by John S. Hancock, bridge engineer of the D. T. & I., to whom we are indebted for the information presented here.



Details of the Track Support

One of the 25-Man Gangs Renewing Rail Near Osage City, Kan.

Missouri Pacific Lays Rail with Small Gangs

TO REDUCE the unproductive time required for closure and to allow the passage of trains on busy single-track lines, the Missouri Pacific is laying rail with small lightly equipped gangs. Studies have shown that on the primary lines of this road, rail gangs working on single track lose an average of three hours of productive time during each working day, or approximately 40 per cent. To insure that this unproductive time will be held to the minimum, no equipment is provided which cannot be taken off the track quickly upon the approach of a train. In general, the power equipment is limited to two Nordberg bolt tighteners and one power-operated Madden rail layer.

Shifted as Necessary

In general, the rail gangs consist of 25 men. Since it is impracticable to organize a gang of this size in such a way as to give each man a specific task which he will perform exclusively, the men must be shifted from one job to another as needed. Consequently, the number of men engaged in any one task will change from time to time in accordance with the requirements of the job as a whole. Again, certain operations are not carried out continuously, but a number of men will be assigned temporarily to these tasks and will return to other work when they have completed them. For these reasons, in describing the activities of the gang during a typical day, the number of men listed in connection with the various assignments will total many more than the number actually in the gang.

Prior to the arrival of the gang, the rail is unloaded on the ground with a rail unloader, while the joints, tie plates, bolts, spikes and other fastenings are stored at the section headquarters, from which they are distributed each day just ahead of the work. Preceding the gang 4 to 6 men score the ties for the larger tie plates that are being used with the 112-lb. rail which is being laid on primary main lines. Following them, 4 men with a power-operated Madden rail layer sets the rail on the ends of the ties, resting on its side with the head outward. Next, one man distributes the new tie plates. Four men with claw bars then pull the spikes from alternate ties or from two ties of each group of three, on tangents, depending on the conditions of the ties and the number of trains that will pass before the rail is released.

Lining Out Old Rail

As soon after this as conditions allow, the remainder of the spikes are pulled, and 10 to 12 men line the old rail out in strings, to the side of the track opposite the new rail. Six men immediately begin the removal of the old tie plates and set and drive tie plugs. In the mean time, as soon as the lining out of the rail is started, one man peddles spikes and another distributes bolts, places the joint bars where they can be reached when wanted, and oils the ends of the rails.

Close behind the men setting tie plugs, 4 to 8 men cut off the tops of the plugs and complete the adzing. One man then sets the tie plates and another turns the rail up workway.

As soon as a sufficient amount of track has been prepared, 8 men with tongs, one of whom also places the expansion shims, set in the rail. One man then hangs the joint bars and 3 others finish the placing of the bolts and start the nuts. If a bolt tightener has been assigned to the gang the bolts will be tightened with this machine; if not the three men will tighten them by hand.

Next, two groups of three men each, with gages do the gage spiking, two men following to tighten any loose ties that may be found. These men also remove the expansion shims. From 9 to 12 men, likewise in units of three each, then complete the spiking. Two signal men accompany the rail gang to bond the track as rapidly as the new rail is laid.

In addition to the activities which have been described, several men, the number depending on the conditions

This article deals with the methods employed in laying rail with gangs of 25 men each equipped with a limited amount of power equipment. Larger gangs have been found unsuited to the conditions encountered owing to the preponderence of single track mileage and the policy of making renewals in stretches of limited mileage

at the individual crossings, are engaged as required in taking out and restoring road crossings. These men also assist in breaking joints through crossings. It is the practice on the Missouri Pacific to use butt-welded rails to eliminate joints through crossings, and the men working on the crossings also assist in handling the longer rails. Butt-welded rails are also used at bridges to bring the joints well away from the ends of the structures.

This description of the activities of the gang assumes that it was not equipped with bolt tighteners. However, most of the rail gangs are now equipped with two Nordberg machines, one of which removes the nuts on the old rail, in which event the rails are lined out individually, while the other tightens the bolt on the new rail.

As soon as the rail layer has set up the day's run of rail for one side of the track, which it does in a short time, it is moved back to set up the following day's run on the opposite side. The four men who are assigned to operate this unit are then released for other duties and the machine can be taken off the track for the remainder of the day, since it is not used to set the rails in place in the track.

The Missouri Pacific considers the surfacing of new rail to be an integral part of a rail-renewing program, for which reason a surfacing gang of 25 men acompanies each rail gang and the two work in close harmony. In fact, it is not uncommon for the follow-up gang, as it is known, to be brought up to assist the rail gang, if for any reason the larger number of men can be worked to advantage for a day or two.

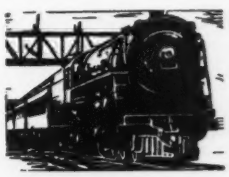
May Do Surfacing

Likewise, since it is the practice on this road to keep the surfacing closely behind the laying of the new rail, if the rail gang finds that it is outrunning the follow-up gang, it discontinues the laying of the rail to drop back and assist in the surfacing. By following this system the danger of damage to the new rail is reduced and the amount of track covered by slow orders is kept at the minimum.

On the Missouri, Arkansas and Memphis divisions where most of this year's allotment of rail is being laid, a change is being made from gravel to stone ballast on all tracks involved in the rail-renewal program. The new ballast is trap rock obtained from a quarry in the Ozark mountains not far from Little Rock, Ark., from which point it can be delivered with a relatively short haul to points on these divisions.

As the final items of the rail-renewing program, the rail ends are surface and cross ground and then heat treated by the oxy-acetylene process.

The methods which have been described have been developed by A. A. Miller, engineer maintenance of way, to meet the specific conditions which have been mentioned. The work is being done under Mr. Miller's general direction and under the direct supervision of A. B. Chaney, district engineer, and that of the division engineers of the divisions involved.



Fatal Derailment on Abandoned Track

AN investigation of a fatal derailment of a switch engine on the Pittsburgh & Lake Erie at South Heights, Pa., on November 22, 1936, disclosed the fact that the track had been occupied in violation of a general order. According to this investigation, which was made by the Bureau of Safety of the Interstate Commerce Commission, this track, a stub siding, was taken out of service by an order issued on March 2, 1933, to save maintenance expenditures on unnecessary tracks. This order was not rescinded, so far as this track is concerned, and although the order specified that spikes should not be removed from switches without making arrangements with the engineering department, the yard engine was run onto this track for the purpose of rerailing a car that had run off the stub end. While moving at 2 or 3 miles per hour within 300 ft. of the end of the track, the track or the roadbed gave way and the engine tipped over and slid down the slope of a 37-ft. embankment. The accident resulted in the death of two employees of the company and in the injury of two others.

Track Not Maintained

The investigation disclosed that the switch had not been spiked for some time and that this was not the first time that this track had been used, although the track was not being maintained. No question was raised concerning the unauthorized use of the track by the track supervisor or the two foremen in whose sections this track was included; in fact, one of the foremen stated that he didn't know it was out of service. The other foreman was on the engine at the time of the accident and had advised the engineman concerning its condition, stating that the ties were in bad condition, but apparently did not consider the track unsafe and did not offer to inspect it ahead of the engine. The superintendent and the engineer maintenance of way stated that they did not know the track was being used.

According to the report of the Bureau of Safety of the Interstate Commerce Commission, the ties in the track were "badly rotted" and records indicated that no work had been done on this track at the point of the accident since 1920. The report stressed the failure of employees and officers involved to take any notice or raise any question concerning the frequent violation of a specific general order.

Santa Fe

Rail Gangs Fu

HAVING been a pioneer in the use of work equipment for both construction and maintenance, it is not surprising that the rail gangs on the Atchison, Topeka & Santa Fe are completely mechanized, so far as power machines and tools are available for the numerous operations which must be performed in connection with the laying of rail and with protecting it against later damage.

From the viewpoint of the officers of the Santa Fe, the actual replacement of the rail constitutes only a small part of the total requirements of a rail-renewal program. For this reason, they see a value in work equipment that goes beyond the usual conception of its use. That is, in addition to reducing the burden of the tasks connected with the laying of rail and the economies which can be effected through its use, they consider many of the machines as important aids in the conservation of ties and rail and as essential to good workmanship.

In addition to having used preservative treatment for many years to increase the service life of its ties, the Santa Fe has established certain well-defined practices which have as their objective further conservation of the ties by reducing mechanical injury to them during the various phases of the rail-renewal work; by minimizing the opportunity for decay; and by requiring good workmanship.

Similar emphasis is placed on the prevention of damage to the new rail, and certain of the activities of the gang have been developed with this as their direct objective. Others, such as care in adzing, in setting in the tie plates and special attention to gaging, are intended as conservation measures for both rail and ties. In not a few cases, therefore, the power machines are considered to be as valuable as aids in the conservation of material as for the economical prosecution of the work.

Good Workmanship Demanded

Good workmanship is looked upon as the most important factor in rail renewal, because it has far-reaching effects in added life for both ties and rail and in improved riding qualities of the track, and it is emphasized at every opportunity. This does not mean that production is ignored or that it is considered to be of little consequence. In fact, the output of the gang is watched as closely as the quality of its work. On the other hand, the attitude of the maintenance officers of this road is that good workmanship should never be subordinated to speed, and that the best workmanship is received through the proper

Four Preliminary Steps —Running Nuts Off the Joint Bolts, Pulling Spikes, Barring Out the Rail, and Removing Ballast

Fully Mechanized

A high degree of mechanization has featured maintenance on the Atchison, Topeka & Santa Fe for a number of years. So thoroughly is this road convinced of the economy of work equipment that power machines and tools are provided for every phase of rail renewal for which such equipment is available. Santa Fe officers believe, however, that this equipment offers further benefits of equal value in the conservation of ties and rail, in that it can be used to protect these important elements of the track structure against both present and subsequent damage.

use of the power machines with which the gangs are equipped.

It is a practice of long standing on this road that when the rail-renewal forces, which include the force engaged in surfacing the new rail, complete their work, the job must be finished. In other words, it must not become necessary later to call on the section or other forces to complete items which have been overlooked, or left unfinished for other reasons, or to correct details which have been done improperly. Thus there are no hidden costs to be taken into account when the rail is laid or later in correcting errors of omission or of commission.

Much study has been given to the equipment and organization of rail gangs by the officers of the Santa Fe, with the view of maintaining a balance between the machines, the number of men required for their economical operation, and the number of men necessary to perform those tasks which must still be done by hand. Equal attention has been directed toward the relation between the speed at which the work advances and the quality of the work performed.

Similar thought has been given to the question of supervision, because experience has demonstrated that where a high quality of workmanship is demanded, adequate supervision by experienced trackmen is imperative if the required standard is to be maintained consistently. On the Western lines of this road, the rail-laying practices of which are to be described shortly, a foreman of demonstrated ability in this type of work is assigned to have charge of the rail gang. In addition to the foreman, assistant foreman are placed in direct charge of the several phases of the work. While on any division the gang is under the jurisdiction of the division engineer and is carried on the rolls of that division.

Trains Were Detoured

One of these completely mechanized rail gangs which has been engaged in laying 112-lb. rail west of Hutchinson, Kan., consists of 105 men, 10 machine operators, 1 foreman and 3 assistant foremen. In this section the line is single track, and normally carries a relatively heavy traffic, both freight and passenger. Between Hutchinson and Kinsley, 84 miles to the west, there is an alternate line through Great Bend. During the working period of the day through freight trains were detoured over the Great Bend line, thus effecting a considerable saving in the productive time of the gang, which would otherwise have been lost in clearing trains.

As it was, two local freight and six passenger trains were scheduled during the usual working period. But by shifting the starting time and the lunch period slightly, only three of these trains caused interference with the work when the others were on time. This was only a slight handicap compared with clearing all trains, including freight trains, that are scheduled over the line during the usual working hours.

Far enough in advance of the gang

Lower Left—The Three Adzing Machines Were Operated in Tandem. Lower Right—The "Soup" Wagon. Right—Swabbing the Newly-Adzed Surfaces

to insure against a temporary shortage of material at any point, but limiting the distribution to each day's requirements, an assistant foreman and six men distributed all material needed for the work, except the rail and joints which were already on the ground. Following immediately behind this unit, but considerably in advance of the succeeding unit of which they were members, one man cut bond wires and removed anticreepers, while another man threw the new tie plates into the center of the track, distributing them roughly to correspond with the spacing of the ties.

Left—The Rail Laying Unit

Right—Bolts Were Tightened By Four Pneumatic Wrenches

Next, two men with power wrenches, one working on the inside and the other on the outside of the joints, backed the nuts off of the bolts. These machines were followed by two spike pullers, each of which required one operator and two attendants. Occasional throat-cut spikes and the spikes at the joints were pulled by hand, one man with a clawbar being detailed to this task. These machines are looked upon as aids in the conservation of ties, since they withdraw the spikes by a vertical pull which does not disturb the wood fibres, instead of with a backward motion which occurs so often with a clawbar, and which tends to enlarge the spike hole. Just ahead of the spike pullers, one man removed crossing planks, planks at motor-car setoffs, and cattle guards.

Next in order, several men and small units cleared the track of material to make ready for the adzing; and following them others prepared for the reception of the new rail. As soon as the spikes were pulled one man removed the joint bars and another man threw out the old spikes and bolts, after which three men with lining bars threw the old rail into the clear. The tie plates were then thrown out by one man, after which another man drove down any stub spikes to insure against damage to the adzer bits.

At this point application of the practices intended to conserve the ties began with the setting and driving of the tie plugs. Obviously, one of the strict requirements is that every spike hole must be plugged with a treated tie plug. Emphasis is also placed on the manner of driving and the necessity for driving the plug as far as possible, either until the top is flush with the surface of the tie or until it has reached the bottom of the hole. Seven men were engaged in this phase of the work, four to set the plugs and three to drive them.

In further preparation for the adzing of the ties, six men reduced the ballast in the cribs sufficiently below the tops of the ties to insure that it would not interfere with the adzer heads. In this section the ballast is a hard blast-furnace slag which interlocks until it is quite difficult to handle with a shovel. To facilitate their work these cribbers, as they are called, had displayed considerable ingenuity in bending the tines of ballast forks to form rakes with which the cribs were cleared quickly and easily to the desired depth.

Adzing Done Carefully

As soon as the cribs were cleaned and the tie plugs driven home, one man with a broom swept all loose ballast and grit from the tops of the ties to conserve the cutting blades of the first adzer. Since a smooth surface is essential to a proper bearing for the tie plate, and since a clean-cut gain will resist decay longer than a torn fuzzy surface, such as will be cut by dull bits, the three adzing machines employed on this work were operated in tandem. The first machine made a rough cut on each tie; the second made an intermediate cut, stopping just short of the finish; while the third made the finishing cut, its sharper bits leaving the surfaces and edges smooth and clean-cut.

In accordance with usual practice, the rail was laid on one side at a time, the other side being brought up on the day following. This permitted the line rail to seat under traffic, thus assuring a uniformly good gage when the opposite rail was laid. Since the new rail is considerably higher than the 90-lb. rail which it replaces, as a still further measure for protecting the rail against later damage, care was

exercised when shifting from the higher to the lower rail, and vice versa, to adjust the adzer heads to insure that the adzed surfaces, that is, the tie-plate seats, on every tie would be in the same plane. This was done to insure proper coverage of the running surface by the wheel treads and uniform wear on the head of the rail.

As has been mentioned, smooth clean-cut surfaces are considered essential to the conservation of tie life. To this end it is necessary that the knives in the adzer heads be kept well sharpened. Obviously, this must be done currently, because they are so quickly dulled in the service to which they are subjected.

A special trailer car is attached to and is pulled by the rail crane. Among other equipment, this car contains a power grinder for sharpening the adzing knives. To keep this work up currently requires three men, one to detach, attach and carry the adzer heads to and from the grinder car. The second man disassembles and assembles the heads, and the third does the grinding.

Ties Swabbed

As a further measure for conserving ties, a 50-50 creosote-petroleum mixture is swabbed hot on the surfaces exposed in adzing. This mixture is heated in a special kettle mounted on the car which is attached to the rail crane, and which in the parlance of the men in the gang is known as the "soup" wagon. The application of the creosote required five men, one to tend to the heating, two to carry the creosote forward and two to do the swabbing. On the average, about 200 gal. of the creosote mixture is used to the mile. It was distributed in drums at intervals in advance of the gang, which were picked up and set on the heater car by the rail crane.

At this stage only two items of preparatory work remained to be completed. As soon as the creosote mixture had been swabbed on the ties three men set the tie plates for the reception of the new rail. At the same time or slightly in advance, one man swabbed the rail ends with oil to prevent frozen joints.

The rail-laying group followed immediately after the completion of the preparatory work, this group being divided into two units. The first of these, working with the full-revolving rail crane with which the rail was set in the track, included the operator, two tong men, one man to handle the hook and guide the rail, two men to set the joint bars on the rail last laid and one man to heel the rail and place the expansion shims.

Following closely behind the crane, two men removed the shims, applied the bolts and started the nuts by hand. The bolts were tightened by four pneumatic wrenches operated from an air compressor on the track. This feature of the work was organized so that two of the tools were in advance of the compressor and the other two to the rear. One man of each pair worked on the outside nuts and the other on the inside, each pair tightening alternate joints.

Working under the supervision of an assistant foreman, the final major division of the gang did the gaging and spiking. The new rail is supported on double-shoulder tie plates, having specially designed bottoms with two cross ribs, thus making it particularly important that the tie plates be placed exactly and that the rail be gaged correctly. To insure that the rail would not ride the shoulder of any of the tie plates, that is, that the plates will be square with the rail and centered on the ties, six men lined the rail to gage and adjusted the tie plates, both laterally and longitudinally, to fit the ties correctly. Four sets of gage spikers, each consisting of a nipper and two spikers, did the gaging, this being the largest wholly manual operation on the entire job.

Spikes Driven Mechanically

Reverting to machine operation, the remainder of the spikes were driven with pneumatic spike drivers operated from an air compressor on the track. The spike-driving unit consisted of 15 men, 8 of whom were equipped with short-handled hammers for setting the spikes, while 4 men handled the "guns" to drive the spikes, 2 men tended the hose serving the pneumatic hammers and changed off at intervals with the drivers, and 1 operated the compressor.

Left—Six Men Lined the Rail to Gage and Adjusted the Tie Plates. Above—The Spike-Driving Unit Included Four Pneumatic "Guns."

One of the items that is given the closest scrutiny is the manner of setting the spikes. Experience has shown that respiking is responsible for shortening the service life of many ties. It has also been demonstrated that if the spikes are set up carelessly it is difficult to drive them and not a few will be bent or not driven straight. For this reason, the men are specially trained to set the spikes straight, and it is forbidden to correct crooked spiking by forcing the spike over with a blow. If for any reason a spike fails to go down straight or is bent in driving, the driving is stopped and the spike is left for later correction. It is the testimony of the officers in charge of this work that since these matters have been given the attention

they deserve, the men have become skillful in setting the spikes and the care which they are exercising has reduced "goose necks" and other forms of improper driving to a small fraction of one per cent.

As the final items, two men with a claw bar and spike mauls followed the spikers to drive joint spikes and to replace the occasional spikes that were driven improperly. Six men then distributed and applied anti-creepers.

In addition to the men who have been mentioned, several others were employed who were not attached specifically to any unit. These included a timekeeper, a combination camp watchman and tool man, two flagmen and two water boys.

On the Santa Fe a rail renewal job is not considered complete until the track has been surfaced, either with or without a major application of ballast. In the territory where this rail gang was working, the track had been ballasted with a hard blast-furnace slag, for which reason only an average raise of about two inches was needed.

It is the common experience that, depending somewhat on the number of ties to be renewed, it requires approximately twice as many men in a surfacing gang as in a rail gang to insure the same rate of progress for both. As it was desired to surface the rail as quickly as practicable after it was laid and at the same rate, a force of 200 men was assigned to this work. This force was divided into 4 gangs of 50 men, each under a foreman and an assistant foreman, with a timekeeper to two gangs. In distributing the work among these four gangs, each one was assigned to surface a mile of track. As soon as this was finished the gang moved ahead of the then leading gang.

Each of these gangs was equipped with a power jack and a 16-tool tie-tamping outfit. They spaced and renewed ties and raised the track, the average lift being about two inches. In this section some curve-reduction work was completed late last year in preparation for highspeed passenger service, and since these curves did not require a general raise, spot surfacing only was resorted to.

In general, tie renewals were heavy, averaging about 800 to the mile. It is of particular interest that most of the renewals involved creosoted ties that had been laid in 1910, indicating an actual service life of 27 years for the ties removed. It should not be assumed, however, that all of the 1910 ties in the track were taken out, for many more were left in than were renewed. Next in order with respect to the number renewed were pine ties that had been treated with zinc chloride and inserted in the track in 1921 and 1922. These were generally in poorer general condition after only 15 and 16 years of service than the older ties, not a few of the latter having been removed only because of excessive spiking. Creosoted ties laid in 1907 were third in point of numbers, the actual life of these ties having been 30 years. The remainder was made up of scattered year's insertions, ranging as far back as 1901. It is an interesting commentary on the effectiveness of the tie-conservation methods employed by the Santa Fe that, except for an occasional tie that had been subjected to external damage, no ties inserted subsequent to 1922 were ready for renewal.

Left—Tie Renewals Average About 800 Per Mile. Below—All Rail Ends Are Heat-Treated

Mobile Equipment

All of the heavy equipment employed by both the rail and the surfacing gangs was completely mobile. When necessary to clear for trains, the rail crane lifted the lighter machines, the adzers, spike pullers, etc., off the track, after which the crane and the compressor units ran to the nearest siding to get into the clear. The compressor units and power jacks employed by the surfacing gangs were removed at setoffs installed in close proximity to the points where these gangs were working. All of the compressor units are moved under their own power. This complete mobility of the compressor units, even while the compressor is in operation, is specially noteworthy, since many roads prefer to purchase compressor units without this feature. Another unusual feature of the work was the constant contact that was maintained with the dispatcher.

Hardening the rail ends to retard joint batter has recently been adopted as standard practice on the Santa Fe, and this process is being applied to all

(Continued on page 422)

The Ends of the Two New Transfer Platforms at Utica, Constructed Entirely of Salvaged Material

Making the Most of Available Material

The reclamation of specific materials may or may not be economical, depending upon the salvage value of the materials, the labor and other expenses involved in securing, handling and reconditioning them, and their available service life as reused. An instance where sizeable economy was effected through the use of salvaged lumber, at least in minimizing out-of-pocket expense and in making available additional desirable facilities which could not have been afforded otherwise at the time, is described in this article. Here, the New York Central salvaged approximately 177,000 f.b.m. of serviceable timber from two old coal trestles for immediate use in constructing 1,290 ft. of l.c.l. transfer platforms which were urgently required to effect certain operating economies.

CONFRONTED with the need for enlarged l.c.l. transfer facilities at Utica, N. Y., to effect consolidated operations and secure sizeable economies, and, at the same time, faced with a program of rigid economy in expenditures, the New York Central recently provided these enlarged facilities through the use of almost 100 per cent salvaged materials, including approximately 3 track miles of rail, 31 turnouts, 98,000 f.b.m. of switch timbers, 6,000 crossties and 177,000 f.b.m. of building timber. The outstanding feature of the work, which, incidentally, was one of the most important considerations which led to approval of the project, was the construction of approximately 1290 ft. of transfer platforms called for in the enlargement plan with timber salvaged from two double-track timber coal trestles that were no longer used. This article will deal almost entirely with this phase of the work.

Old Facilities Inadequate

For many years the Central has maintained l.c.l. freight transfer facilities at both Utica and West Albany, N. Y. As a result of changes in traffic conditions in recent years however, and, more particularly, the routing of most of the road's through freight between New York City and the West around Albany, over what is known as the Castleton cut-off, completed in 1924, it became evident that appreciable economies and improvements in service could be had by consolidating the West Albany facilities with those at Utica.

The existing facilities at Utica included essentially an inbound freighthouse of brick construction, 700 ft. long by 50 ft. wide, and an outbound freighthouse of the same type of construction, 500 ft. long by 30 ft. wide, with a group of eight tracks between them, arranged in pairs and served by four covered island platforms at car-floor height. At the time the enlargement of the facilities at Utica was being considered to permit the transfer of West Albany business to this point, the l.c.l. business was such that both inbound and outbound business at Utica was being handled through the inbound house alone, the outbound house being out of service.

The plan to consolidate the West Albany l.c.l. transfer with the Utica transfer required not only the reopening of the old outbound freighthouse, but also the enlargement of both track and platform facilities. Specifically, the plan called for 8 additional loading tracks, each with a capacity of 20 cars, to be located north of the old outbound freighthouse; 4 additional storage tracks with a total capacity of 60 cars, to be located south of the inbound freighthouse; and 2 additional transfer platforms, one 860 ft. long and the other approximately 430 ft. long. The longer of these platforms was to be located north of the old outbound freighthouse between Tracks 3 and 4 in the new eight-track pocket, where it would serve all eight tracks, and the shorter platform was to be located directly east of and adjoining the east end of the outbound house. A feature of the new track layout was the pro-

vision of a completely separate lead for the new eight-track pocket so that two switch engines could operate at the transfer point simultaneously without interference.

Second-Hand Material

Confronted with the necessity of enlarging these facilities at a minimum of expense, it was decided to carry out the work so far as possible with second-hand material. As far as the track material was concerned, this presented no particular problem, sufficient rail, switches, frogs and track fastenings being available. Securing second-hand building material for the transfer platforms, however, might have been a problem if it had not been for a decision to secure the necessary material from two old double-track coal trestles which were no longer in use, which it was calculated had more than enough sound material in them to construct the 1290 ft. of platforms required.

The general design of platform for the enlarged facilities was similar to that of the existing platforms, including a deck structure 16 ft. wide, 3 ft. 9 in. above the top of rail, covered by a butterfly-type shed or canopy. The plans called for 6-in. by 12-in. mud sills, 12-in. by 12-in. posts and caps, 3-in. by 8-in. lateral bracing, 8-in. by 8-in. joists, and a 3-in. plank deck. Plans for the platform sheds called for 10-in. by 10-in. center posts on 20-ft. centers, double 4-in. by 10-in. roof spreaders, 4-in. by 8-in. roof braces, 6-in. by 12-in. and 8-in. by 12-in. purlins, 2-in. by 6-in. rafters, and ¾-in. or 1-in. roof boards.

Close-up View of a Section of the New Platform Deck

The two old coal trestles were located at Indian Castle, N. Y., on the West Shore line of the Central, approximately 25 miles east of Utica, and at St. Johnsville, on the main line, approximately 32 miles east of Utica. The trestle at Indian Castle, which had been constructed in 1912, and which was in service until 1928, had a total length of approximately 890 ft. This included a single and double-track approach incline, approximately 500 ft. long, on a grade of 5 per cent, and a level double-track coal pocket section, approximately 290 ft. long by 27 ft. wide, and 31 ft. in height to base of rail. The pocket or dumping section of the trestle was entirely housed in above the track structure by a timber shed which had a wall height of about 18 ft. and a simple double-pitched roof.

Throughout the entire structure, 12-in. by 12-in. long leaf yellow pine timbers were used for mud sills, plumb and batter posts, and caps. All lateral bracing was 3-in. by 10-in. pine. The deck consisted of three lines of 8-in. by 16-in. stringers beneath each rail, with 8-in. by 8-in. crossties, 8, 11, and 24 ft. long, the longer ties being used in the double-track area and at intervals throughout the length of the incline to support side walkways as well as the track. Directly within the pocket section of the trestle, short length ties were used in both tracks to permit the free discharge of the coal through them and into the pockets.

Pocket Section Enclosure

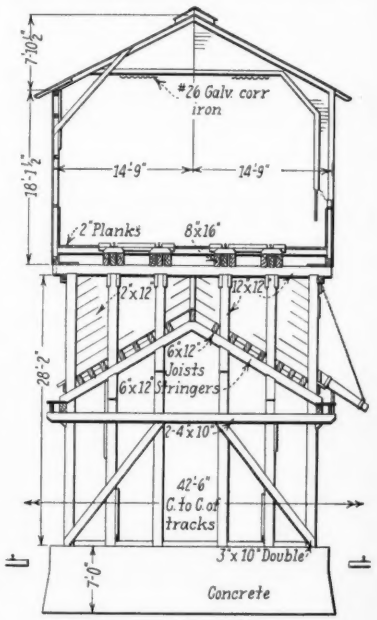
The enclosure of the pocket section of the trestle was constructed with 3-in. by 6-in. yellow pine studding, 2-in. by 6-in. girts, and 2-in. by 6-in. rafters and roof braces. The roof covering was 1-in. matched hemlock plank, while the sides were enclosed with ⅞-in. yellow pine novelty siding. Other timber of some consequence in the trestle was employed in the pocket framing itself, which included a large number of 6-in. by 12-in. by 14-ft. stringers and 6-in. by 12-in. by 12-ft. joints.

Careful examination of the structure showed that approximately 70 per cent of the timber was sound, with from 50 to 70 per cent of its service life left. None of the timber in the trestle had been treated, except that the specifications for the trestle construction in 1912 had required that the heads and shoulders of all posts, the bottoms of all sills, all bearing surfaces in contact, and all butt joints of caps, sills and posts receive two coats of a satisfactory wood preservative.

The coal trestle at St. Johnsville, which was built in 1909 and taken out of service in 1930, was of practically the same size and type as that at Indian Castle, being approximately 790 ft. long, with a 288-ft. enclosed double-track pocket section. The framing throughout this trestle was also practically identical with that employed in the Indian Castle trestle.

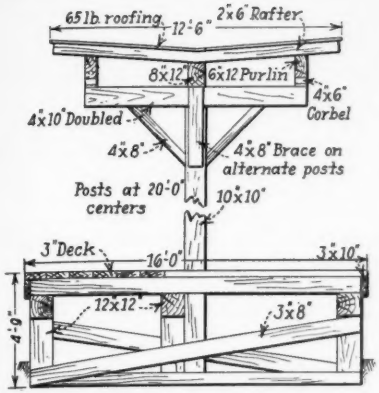
Dismantling Work

The use of the timber from the two old coal trestles required their complete dismantling, which was carried out in each case with the assistance of a locomotive crane. The only essential difference in procedure was that the dismantling of the Indian Castle trestle was done with the crane located alongside on one of the old coaling tracks, whereas in the dismantling of the St. Johnsville trestle, the crane worked from the top of the trestle, backing off as the work progressed. This latter procedure was necessary because of the fact that the trestle was located between two operating tracks, neither of which could be obstructed for any appreciable period of time.



A Section of One of the Old Coal Trestles Through One of the Coal Pockets, Showing the Sizes and Types of Timbers Which Their Dismantling Made Available

A gang of 8 to 13 men carried out the demolition of each of the two trestles, working largely with hand tools, but employing acetylene torches for cutting drift bolts. At the same time a gang of 30 to 34 men carried forward the construction of the new transfer platforms at Utica. Prior to the start of the work, complete bills of material for the platform construction, and lists of the timber available from



Typical Cross Section of the New Transfer Platforms Built at Utica from Timber Released From the Two Old Coal Trestles

the two coal trestles showed at a glance just how the released material was to be used in the platforms. At the same time, a material program showed the order in which timbers of the various sizes would be required at Utica in order that the work might progress smoothly and without interruption.

Much of the timber released was of the correct size for immediate use, except for length, but a considerable part of it had to be resawed to the sizes required. Altogether, 16 carloads of timbers were sent to the road's treating plant at Rome, N.Y., for resizing and forwarding to Utica. With each car was furnished a bill of material and specific instructions for resizing.

All timbers already of proper size, which included 40 carloads, were shipped directly to the site of the work, where they were cut to length and framed as necessary by hand or power-operated crosscut saws or on a portable electric woodworking machine. All boring for bolted connections was done with electrically-operated power drills.

In adapting the trestle timbers to the platform construction, the 12-in. by 12-in. plumb and batter posts, as well as the 12-in. by 12-in. caps and sills, were used, unaltered, for platform posts and side and center sills, and, as resawed, for the 10-in. by 10-in. roof-supporting posts, the 4-in. by 10-in. roof spreaders, and for the 6-in. by 12-in. mud sills. The 8-in. by 16-in. deck stringers were converted largely into 8-in. by 12-in. roof purlins, 3-in. by 8-in. deck planking and 4-in. by 8-in. roof bracing. Most of the 6-in. by 12-in. roof purlins required for the platform sheds came from the 6-in. by 12-in. stringers and joists making up the bottoms of the coal pockets, while the larger part of the deck planking came from the longer resawed trestle ties.

All of the 2-in. by 6-in. platform shed rafters came from the 3-in. by 6-in. studding and 2-in. by 6-in. girts, rafters and roof bracing salvaged from the enclosures on top of the old coal trestles, and all of the shed roof decking was adapted from the 7/8-in. pine novelty siding and 1-in. matched hemlock roofing boards of the old trestle enclosures. The novelty siding was turned over as reapplied on the shed roofs to afford a smooth top surface, and the entire deck was then covered with 65-lb. prepared roofing. Any material taken from the old trestles which showed rot that could not be removed completely in the reframing or resizing work was thrown out and destroyed near the sites of the trestles, so that only sound timber was used in any part of the transfer platforms. Altogether, approximately 70 per cent of the timber in the Indian Castle trestle and approximately 80 per cent of that in the St. Johnsville trestle was salvaged, amounting to approximately 177,000 f.b.m.

The work of dismantling the old coal trestles and of constructing the additional transfer platforms was carried out by the bridge and building forces of the road under the general direction of A. R. Jones, division engineer of the Mohawk division, and T. P. Soule, general supervisor of bridges and buildings, Lines Buffalo and East, and under the immediate supervision of E. E. Tanner, supervisor of bridges and buildings of the Mohawk division. Complete demolition of the two trestles required a period of approximately 10 weeks, while the alteration and enlargement of the building structures at Utica was done within a period of approximately 12 weeks.

Republic Steel Corp. Opens New Wire Mill

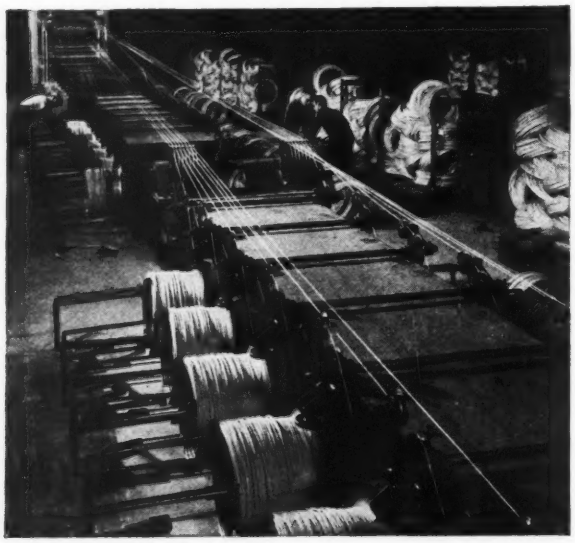
THE Republic Steel Corporation has just constructed a new wire mill at South Chicago, Ill., in which are incorporated a number of advancements in the technic of wire manufacture, including an improved electro-galvanizing process. This plant, which was formally opened for operation on April 27, has a capacity sufficient to galvanize 578 miles of fence wire in a day.

While the electro-galvanizing of wire is not a new development, recent improvements in equipment and procedure have been incorporated in the South Chicago plant, which permit the electro-galvanizing of round wire with heavy coatings at commercial speeds. Among these improvements is the galvanizing solution used, by means of which it is said to be possible to deposit on round wire uniform, highly ductile coatings without pores or pits at current densities up to 1500 amp. per square foot of surface being galvanized. It is pointed out that early solutions for electro-galvanizing permitted the use of current densities of only 5 to 20 amp. per square foot, making the deposition of zinc so slow that the production of wire at commercial speeds would have required galvanizing tanks of prohibitive length. Development of the new

One of the Battery of Machines for Producing Woven Wire Fence

solution made possible the installation of a galvanizing unit operating at commercial speed with a tank 140 ft. long.

Another feature of the process involving improvement is the method of cleaning the wire prior to galvanizing it, which is the result of experimental work with many processes. Although not involving highly corrosive reagents or high temperatures, the process used is said not only to clean the wire thoroughly, but to etch the surface to the degree most favorable for firm adhesion of the zinc coating.



Take-Up Reels at the End of the Electro-Galvanizing Line in the Mill

The essential features of the wire mill are the rod yard, the cleaning house, the rod bakers, the wire-drawing department, and the electro-galvanizing department. There are also departments for producing nails, field fence, barb wire and bale ties. The rod yard has a capacity of 2,800 gross tons and is serviced by a five-ton high-speed crane with a 96-ft. span and a double-tilting hook. Steel racks are provided for piling rod coils six high in individual lanes and a broadside transfer conveyor is located near the center of the yard where it conveys the rods directly into the cleaning house.

The building containing the latter facility is of acid-resisting construction throughout and embodies glass brick in place of conventional windows. The cleaning line consists of three reinforced concrete acid-proof brick-lined cleaning tanks, a rinse tank, three sull tanks and three lime tanks. Acid is stored in two 8,000-gal. tanks and is fed by gravity to two measuring tanks. The cleaning tanks are heated by jets, and spent acid is discharged from the tanks by a syphon in each tank.

Located between the cleaning and wire-drawing departments is the rod baker. This unit is of the modern two-lane type, is fired indirectly with natural gas and is equipped with automatic temperature control. At the discharge end of the baker the rods are delivered to a ram rack immediately behind the wire-drawing machines. At this point the rod coils are butt-welded for continuous drawing and are flipped direct from the rams to the wire-drawing machines, of which there are eleven. These machines are serviced by high-speed tram-rail hoists which strip the wire from the drawing blocks and deposit it on specially-designed racks mounted on corrugated steel skids which are transferred to the storage, nail or galvanizing departments by electric lift trucks.

Galvanizing Department

On arrival in the galvanizing department, the coils of wire are placed on pay-off reels (of which there are 80). Extending from these reels 40 strands of the wire are first normalized in a pot of molten lead and then pass through cleaning and rinsing tanks, which extend for a distance of 70 ft. Thence they enter the electro-galvanizing tank. This tank is 140 ft. long, 6 ft. wide and 2 ft. deep and requires approximately 43,000 gal. of solution. Thirty tons of zinc anodes are immersed in this solution in the bottom of the tank, while the wires, functioning as cathodes, pass through the solution slightly below the surface at speeds ranging from 35 to 70 ft. per min., depending on the coating to be applied. It is possible to deposit on the wire 27 successive coatings of zinc that is 99.9 per cent pure. After passing out of the tank the galvanized wire is rinsed and dried before it is wound on the take-up reels.

Santa Fe Rail Gang

(Continued from page 418)

new rail shortly after it is laid. For several reasons, this road prefers to do the hardening in the track rather than to have it done at the mill, the principal one being that it is thus able to eliminate the mill tolerance by grinding the adjacent rails to a common height before the ends are hardened.

To insure that the tie plates were fully seated and that the rails were in their permanent relative positions, the grinding followed at some distance behind the rear surfacing unit, both the cross grinding and the surface grinding being done by a single unit consisting of two grinder operators and two helpers equipped with grinders suitable for these classes of grinding.

The heat-treating unit consisted of one foreman, one helper and four trackmen, two of whom were employed as flagmen. Equipment of special design was employed in this work. The heat-treating machine, which runs on railway mounting, utilizes six oxy-acetylene tips on each side of the track for heating the rail ends. The rail was brought to a temperature of 1,550 deg., F., in about 18 sec., and was then allowed to cool naturally without quenching. According to tests the hardened area of the rails has a Brinell hardness of 350 to 375.

To avoid the possibility of damage to the signal bonds from the heat of the hardening operation, the application of the bonds was deferred until the heat treating had been completed. There was, therefore, a lapse of about six days between the laying of the rail and the bonding of the track; yet no difficulty was encountered in the operation of the signals during this interval.

Finally, as the last item of the work, the released rail, all usable material and scrap were loaded, leaving the right-of-way clear. Since the surfacing was kept close behind the laying of the rail, it was considered desirable to defer the cleaning up until the surfacing gangs had completed their work.

The organization of the gangs, the development of the methods and the assignment of the equipment has been carried out under the general direction of H. B. Lautz, J. A. Gillies and W. W. Kelly, general manager, assistant general manager and chief engineer, respectively, of the Western lines of the Santa Fe. The work of the several gangs was under the direct supervision of W. C. Baisinger, superintendent, and R. G. Whyman, division engineer.

What's the Answer?

Should They Work Tandem?

When adzing ties with a battery of power adzers, is it preferable for each machine to complete the cut on each tie it adzes, or should all of the machines work on every tie?

Avoids Backward Movement

By H. F. Fifield
Engineer Maintenance of Way, Boston & Maine, Boston, Mass.

It is preferable to have all of the machines work on every tie. This can be done without stopping the machines, or requiring a backward movement of any machine to make a second pass over the tie. If the blades are set to get the right cut, the tie will be adzed to the proper depth when the last machine of the battery has passed over it. In this way there will be no stopping of the machines or other delay to the progress of the track laying which is following closely behind rapidly than they would be otherwise, and cannot be kept in condition to make the final finishing cut. This difficulty would be encountered with all of the machines if each one was required to finish its own tie.

Furthermore, since some ties require heavy adzing while others require little or no adzing, uniform progress could not be maintained by the battery if each machine was required to complete the cut on each tie it adzed. That is, if each of the three machines in the battery was assigned to adze one third of the ties completely, the lead machine might encounter heavy adzing, and thereby delay the following machine which might have ties that required only the lightest adzing. If the practice of requiring every machine to work on every tie is adopted, this delay will be avoided and a uniform rate of progress will be assured.

Work on Every Tie

By B. R. Kulp
Engineer of Maintenance, Chicago & North Western, Chicago

When adzing ties with a battery of power adzers, we prefer to have all of the machines work on every tie, our practice being to have the first machine make the roughing cut, the second to bring the adzing nearly to the finished level, and the third machine to make the finishing cut. We hold the operator responsible for the final condition of the adzed tie, for which reason we endeavor to man the last machine with the most expert operator, selecting a man who is known to have good judgment as to the requirements of a finished tie.

The advance machine which makes the roughing cut generally encounters the greatest amount of gravel and other forms of grit, with the result that the cutter bits are dulled more

Can Accomplish More

By J. E. Johnston
Roadmaster, Southern Pacific, Douglas, Ariz.

Where a battery of adzers is employed, if the ties are all sound, each machine may be allowed to complete the cut on each tie it adzes. This condition seldom occurs, however, because on the typical rail-renewal job, for which adzing machines are adapted particularly, many of the ties are in poor condition and must be removed from the track shortly after the rail renewal has been completed.

The upper surface of these ties is full of grit and ballast and if we expect to obtain the most effective results, including a smooth finishing cut, it has been found beneficial to remove

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in August

1. When cleaning ballast on multiple-track lines, to what depth should the inter-track space be cleaned? Why? Should provision be made for drainage? If so, what?

2. What are the relative merits of sheet lead, iron rust and cement grout for distributing the bearing load on bridge seats? What are their limitations?

3. To what extent should the operator of a power machine be expected to keep it in repair?

4. Should an icehouse be ventilated? Why? If so, what is the best way to do it?

5. What is the significance of the colors painted on the ends of new rails? Of unpainted ends? Where should each of these classes of rail be used?

6. How often should service tanks be cleaned at a water treating plant? What is the best way of disposing of the sludge?

7. How heavy must tie renewals be to warrant a general raise in connection with their renewal? How is this determined?

8. Where a concrete or metal culvert is being installed to replace a timber trestle, should necessary alterations to the trestle be made by the culvert gang or by a bridge carpenter gang? Why?

one third of the blades from the head of the lead machine, using this machine to make the first rough cut to remove the ballast and dirt. This should then be followed by the second machine, with all of the cutting blades in position to make the finishing cut and a smooth adzed surface. This method also reduces wear on the blades and saves considerable of the labor of sharpening the blades, enabling us to accomplish more in a day and to do the work to a higher standard than would otherwise be possible.

Each Takes Its Bite

By E. P. Safford
Supervisor of Track, New York Central, Silver Creek, N.Y.

My experience indicates that there is only one satisfactory way to operate adzing machines. Enough machines should be used to keep them moving along continuously at an even gait which will keep them ahead of the rail crane or of the gang setting in the rails if a crane is not used. To do this, the machines should move forward as a unit, each machine taking its bite of every tie as it passes.

Ties in any track which has been in service long enough to require renewal of the rail will have varying periods of service. Those which have served only a few years will require no more than touching up, while those that are older may require heavy adzing. If it became necessary for a single machine to make the complete cut on such ties, considerable time would be required to do so, and if the following machines chanced to meet with light adzing they might be compelled to be idle for a part of the time.

Make Them Assets

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Probably no investment that can be made by a railway will bring a higher return than the money spent for adzing machines. Yet, like most other power machines, they can be made a liability instead of an asset unless they are used properly. The value of this equipment is two-fold. In the first place, two or three machines, each manned by a single operator, will do as much work as 30 to 40 men can do by hand where the adzing is particularly heavy, and as much as 20 to 25 men will do where it is light to medium. As important as these economies are, however, the greatest value of these machines lies in the better quality of the work they do when used properly, as compared with hand adzing. On the other hand, if they are not used properly, the damage to rail and ties may offset any other benefits that are derived from their use.

In general, the condition of the ties will be the deciding factor as to the number of machines to be worked, the importance of this decision being that there must be a sufficient number to keep out of the way of the rail crane, while there is no economy in having so many that they do not work to full capacity. If the ties are sound and but little cut by rail or tie plate, two machines may be sufficient. Normally, three should be employed.

It is most desirable to have every machine make a cut on every tie. In operation, the first one makes a rough cut, cutting off the tops of projecting tie plugs and removing all decayed or otherwise unsound wood, below the embedded ballast particles and grit. This leaves sound wood free of foreign matter for the second machine which should make the intermediate cut, stopping just short of the finish, which should be made by the third machine. The knives on the cutter head of the leading machine soon become dull and cannot be kept in condition for finished work. By using the third machine there is greater assurance of sharp knives to make a smooth finishing cut.

So great is the importance of the third machine in this respect that the most skillful operator should be assigned to it, and it should be given special supervision by the foreman and the assistant foreman in charge of the unit to which the adzers belong. It should not be overlooked that unless the seats for the tie plates are in the same plane on every tie, the rail is certain to receive damage. For this reason, when the new rail is higher than that which is being released, and the adzer is being changed from side to side as the rail is laid first on one side and then on the other, the cutting heads must be adjusted at each change to insure that the tie plate seats will be in one plane. Otherwise the rail will be tilted and the wheels will not cover the running surface fully.

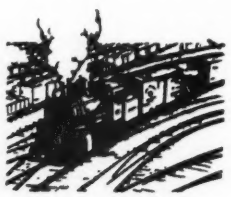
When a Spring Is Encountered

When a spring is encountered in sinking a foundation pit or installing a culvert, how can it be sealed?

Many Factors Involved

By J. S. Huntoon
Assistant Bridge Engineer, Michigan Central, Detroit, Mich.

How a foundation pit should be sealed will be determined by a number of factors, including the character of the soil, the amount of water coming in, the pressure of the water, and whether it is concentrated at one point under a heavy hydrostatic head or whether it comes rather uniformly through the bottom of the pit. When the excavation is in somewhat impervious soil, with only a limited amount of seepage coming into the pit, it is the usual practice to place a pump at one end of the pit, pump out the water and follow this with a concrete seal or with a concrete footing, by starting to deposit the concrete at the end of the pit opposite the pump. After the concrete has been placed, it is desirable to discontinue the pumping and allow the pit to be flooded with water until further masonry is to be placed on the footing or seal course.



A spring flowing into an excavation pit under hydrostatic pressure requires special consideration. If the flow is stopped by filling the hole with concrete, the pressure of the stream is likely to soften the ground under the roadbed or it might undermine the track at some point near the pier or abutment. It is preferable to conduct the stream through a pipe located permanently back of the structure or through the masonry to a point where it can discharge without damage to the structure. Where springs are encountered in constructing grade-separation excavation pits, the water should be conducted through pipes connected to storm drains.

Water in excavation pits through porous or semi-porous soils, with sand boils and springs, can be taken care of by various methods. Well points driven below the excavation around the outside perimeter of the coffer dam can be pumped to unwater the pit, provided the excavation does not

extend to such a depth that the water cannot be handled conveniently by ordinary pumps.

It has also been found convenient and economical in some cases to construct a small wooden box around the inside perimeter of the cofferdam, connecting it to the pump sump. This box is ordinarily built with two sides and a top, the floor being omitted so that the water may be collected and led into the sump. The depositing of the concrete seal or footing course should be started at the end of the cofferdam opposite the sump. By depositing the concrete in this manner, the water will be driven into the wood box and caused to flow into the sump. This method of taking care of the water from small springs in excavation pits in gravel soils has often been used with satisfactory results.

Problem May Be Serious

By General Inspector of Bridges

Springs encountered in sinking foundation pits, including the construction of culverts, often present problems of a serious character. Fortunately, they are encountered in a relatively small percentage of foundation excavations, although water in some form is rarely absent from these pits. While certain generalizations can be made, almost every case has some special features which make it an individual problem.

Ordinary seepage sometimes occurs in such volume that it is fully as difficult to care for as the flow from a spring. On the other hand, the spring may be, and usually is, discharging under head. If this head be low, it may present no particular difficulty; if it be high, it may tax ingenuity to overcome the trouble. As a rule, the simplest method is to drive a pipe into the outlet channel of the spring and allow the water to rise in the pipe until the head is overcome.

Where the head is low, the water in the pipe will be stationary and the pipe can be plugged by forcing cement in a cheese-cloth sack into the pipe and allowing it to set. If the head is sufficient to cause the water to flow to the surface of the ground, the pipe should be extended above the ground line and used as a permanent outlet. In a few cases of which I have heard, it has been found desirable to redesign the structure rather than to risk locating a substructure over the outlet to a spring.

Another scheme which I have employed with success on several occasions, was to keep the water down with pumps until the excavation was completed. The pumping was then stopped, the water was allowed to rise in the pit to equilibrium and the concrete for the footing course was deposited through a tremie.

Where seepage similar to the inflow from a spring occurs in sand or gravel strata, this inflow can usually be curtained off by driving well points at close intervals around the outside of the cofferdam and pumping from them continuously.

Cleaning Steel for Painting

What methods can be employed to clean steel surfaces preparatory to painting? How effective is each?

Three Methods Usually

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Three methods are in common use for preparing steel surfaces for painting: (1) hand methods, using hand tools such as chipping hammers, wire brushes and scrapers; (2) the use of pneumatic tools, including rotary wire brushes and both chipping and scaling tools; and (3) by sand blasting. The hand method is generally used to clean ahead of spot painting, in cases where only light cleaning is required and where the size of the job does not justify the setting up of a power plant for sand blasting or to operate pneumatic tools. Power tools are recommended for those cases where corrosion is so extensive that hand methods are not effective or economical. It is not debatable that the most thorough job of cleaning can be secured by sand blasting, provided the proper equipment is employed and a highly abrasive sand is used.

The cost of cleaning by these methods varies with the type of structure, the condition of the steel, the season in which the work is done and the final results that are demanded.

Both hand and power tools are quite effective and economical for removing light rust and scale, but they will not produce a polished surface, some corroded material always remaining, even on the best and most conscientiously conducted jobs. As already mentioned, however, while effective, the power tools may not be economical if the job is small, for the cost of setting up the power plant may actually cost more on some small jobs than the cost of cleaning by hand and painting. Sand blasting, when properly done, assures cleaning to the highest standard practicable.

In addition to the methods which have been mentioned, much thought has been given in recent years to the use of penetrating oils to loosen and remove scale and rust and to retard further corrosion. These rust inhibitors, of which several are available, are much cheaper than mechanical cleaning and in practically all cases they have shown themselves very effective. Some of them have the added advantage that after they have loosened the heavy scale, it can be removed and paint can be applied to the surface which is still covered by the inhibitor.

Sand Blast Effective

By G. L. Staley
Bridge Engineer, Missouri-Kansas-Texas, St. Louis, Mo.

Structural steel is generally cleaned preparatory to painting by means of hand tools, such as metal scrapers, chisels, hammers, wire brushes, etc., or with power tools, including chipping hammers, rotary wire brushes, etc., or by the sand blast. A combination of hand cleaning to supplement, or supplemented by, either power tools or the sand blast is ordinarily required to insure a good job.

Hand cleaning is not effective on pitted metal, although on smooth undamaged surfaces it serves very well. A power chipping tool and wire brush are more effective, principally because the men find them easier to handle and less laborious to use. A sand blast operated conscientiously is the most effective method for cleaning steel that is so far in common use. A very satisfactory job of painting is possible where metal surfaces have been prepared by the sand blast.

On old work, especially on metal that has been allowed to corrode rather badly, hand cleaning, followed by the application of one of the several so-called rust preventives now available merits consideration. This

appears to be a practical direction from which to approach the problem.

For new work, there seems to be some merit in the practice followed by the highway departments of several of the states, of erecting all new steel unpainted. It is allowed to remain in service in this condition for six months to a year, until the mill scale is loosened by rust, after which it is sand blasted and painted. This practice insures that when the paint is applied it will be to a clean surface free of scale.

New Joints on Old Rail

What advantage, if any, is there in applying new joints to old rail? When laying released rail?

Depends on Where Used

By J. Morgan
Supervisor, Central of Georgia, Leeds, Ala.

It is scarcely open to question that the application of new joints to old rail will be of advantage since joints, like everything else, wear with use. Whether the advantage will be sufficient to warrant the expenditure is another matter which will warrant careful consideration. If the rail is in a high-class main line or in other heavy-traffic tracks, and the ends of the rails and the joint bars are worn considerably, as may be expected where the present joints have been long in service, it will be wise to apply new joints.

Such an application will strengthen the joint and will thus reduce the joint-maintenance cost to a point about where it should be with new rail. The full benefit of applying new joints will not be realized, however, unless the irregularity of the worn rail ends is eliminated by welding to bring these rail ends to the same elevation as the remainder of the running surface.

If released rail is to be used in less important tracks, such as sidings or branch lines of light traffic, it may be satisfactory to use the old joints provided they are not too badly worn. If they are badly worn, it is probable that enough saving in maintenance can be realized to warrant new bars or the reforming of the old ones. Rail joints with a slack fit are a constant source of expense for joint maintenance which can be reduced only by applying joints that fit tightly to the fishing surfaces of the rail.

Sees Advantages

By H. J. Weccheider
Division Engineer, Erie, Hornell, N.Y.

It is scarcely debatable that considerable advantage can be derived from applying new joints to old rail. Before deciding that this should be done, however, advance consideration should be given to the general condition of the rail, the amount of traffic it is carrying and any other factors which may have a bearing on whether the expenditure for the new joints is warranted. If the traffic is heavy and particularly if any considerable part of it is handled in high-speed trains, and if the rail is becoming surface-bent or worn, it will be more logical to replace the rail with one of heavier section rather than to install new joints on the older and lighter rail.

Where the rail ends are to be built up by welding, it should be understood that the welding, of itself, will be of no particular advantage unless the joints can be kept in good surface. In connection with welding programs it is important, therefore, that a careful study be made of the condition of the joints. It is quite likely that the surface of some of the joints can be helped noticeably by the simple expedient of reversing the joint bars. In other cases, the application of rail shims will be sufficient, while in most cases new joints will be necessary. The bars thus released can be used in yard tracks.

Application of the new joints will result in an actual saving in the cost of building up rail ends, since the length and depth of the welds will be reduced substantially. It has also been found that head-free bars will change the joint stress, give a new and stronger bearing and extend the life of the rail.

We have found from actual experience that the life of 12-year old, 100-lb. rail can be extended four years by equipping it with new joints. Heavier rail is also subject to this same treatment. Our work on the heavier sections has been largely in connection with programs of building up the ends. It is impossible to say at this time from our experience what increase will be secured from old heavy-section rail with built-up ends and new joint bars, but we are of the opinion that this reconditioning, in the case of 130-lb. rail, for example, will extend its life at least six or seven years. At the same time, it is obvious that during the extended life of the rail, the cost of joint maintenance will be reduced, and that we will have smoother riding track.

Deterioration of Fire Hose

What can be done to prevent the deterioration of fire hose on hose carts? On standpipes in buildings? How often and by whom should they be inspected?

Inspection Important

By Supervisor of Bridges and Buildings

I consider the inspection of fire hose, and all other fire protection equipment as well, to be of such great importance that I am starting my comments with this subject. Fire-protection equipment is intended for use in emergencies, and there is little benefit in investing money in such equipment unless there is reasonable assurance that it will be operative when the emergency arises. When a fire breaks out, no time is available to make repairs or to seek substitutes for equipment that fails; the structure may be destroyed or beyond saving by the time this can be done.

For these reasons, the inspection of fire hose should be regular and severe, no section of hose that is open to suspicion being allowed to remain in the live equipment for putting out fires. Inspectors should know that fire hose is being used for fire-protection purposes only, and that after such use it has been drained, or dried as the case may be, before it is returned to its reel or rack. Despite the most rigid prohibition, there is a marked tendency on the part of employees, especially in buildings that are equipped with fixed hose reels with a single section of hose on each, to sneak a fire hose off the reel occasionally to use for washing down floors, sprinkling driveways or other purposes not connected with fire prevention. Measures should be taken to stop this practice, for the hose may be returned to the reel in damaged condition; it is seldom drained of water after such use; and in some cases it may not be returned to its proper place on the reel.

Linen hose is employed in build-

ings, generally in those equipped with interior fire lines (standpipes) having connections at every floor. This hose is seldom subject to abuse, since it is rarely used. If it is dried thoroughly after use and is kept dry, little deterioration is likely to occur.

Rubber-lined cotton hose is used most extensively because it costs somewhat less than the linen hose and will stand rougher usage. It is not subject to such rapid deterioration when wet, for which reason it is suitable for many purposes for which linen hose is not adapted. It should be well drained after use, but should not be allowed to dry out completely. To avoid this it should be removed from the reel and have water passed through it about once every three months, unless it has been used in legitimate service at shorter intervals.

Folding does not harm a linen hose, provided it is kept thoroughly dry. For this reason, it can be folded on a rack designed for this purpose, from which it can be taken easily and quickly when needed. On the other hand, folding may result in serious damage to a rubber-lined hose, which should be wound on a reel.

Depends on Kind of Hose

By Inspector of Buildings

In large part, the precautions that must be taken to prevent deterioration of fire hose will depend on the kind of hose that is under consideration. In railway fire-protection service there are only two kinds of hose in general use, rubber-lined cotton hose and linen hose. The former is used on hose carts and on reels in such buildings as freight houses, shops and elsewhere where it is likely to receive rough usage or to be used frequently. This hose should not be folded but should always be wound on a reel.

It is highly important that rubber-lined hose be drained thoroughly after use, before it is returned to the reel. If this is not done both the rubber lining and the cotton fabric are likely to deteriorate rapidly. On the other hand, the rubber lining will crack if it is allowed to dry out completely, for which reason if it is not being used it should be unreeled at intervals of about 90 days and water should be passed through it.

In general, the use of linen hose is confined to the better class of buildings where it is employed for fire purposes only, obviously only on rare occasions. A linen hose will last almost indefinitely if it is kept dry. Folding does not affect it noticeably, for which reason it can be hung in folds which do not need to be changed, as is necessary with rubber-lined cotton hose. It does deteriorate rapidly, however, if it is allowed to remain damp. It should, therefore, be dried thoroughly after use, and special care should be exercised to insure that it is kept dry at all other times.

Fire hose should be inspected at least once a month by the regular building or water-service inspector assigned to this work. The supervisor of bridges and buildings should include it in his quarterly building inspection, and the superintendent of fire protection should make an annual inspection of all fire equipment.

How to Keep Camps Sanitary

What measures should be taken to insure sanitary conditions and freedom from vermin in camp cars and bunk houses? Who should look after this?

Must Fumigate

By A. A. Miller
Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

I favor the use of any of several well-known brands of fumigants for ridding camp cars used as sleeping and eating quarters for employees. These include bunk, kitchen, commissary, dining, office and combinations of any of these. We have found that the use of these fumigants in accordance with the recommendations and instructions of the manufacturers, respecting dosage, frequency of treatment and the proper sealing of the cars before they are fumigated, offers the best means for the eradication of rats, mice, bed bugs and other vermin.

Past experience has convinced us that the most effective results can be obtained by delegating the fumigation of the cars on each operating division to maintenance of way employees who are experienced in the use of fumigants for this class of work. They fumigate "out-of-face" all work cars occupied by our employees in accordance with the dosage and frequency of treatment specified by the manufacturer supplying the fumigant we use.

Eradication of vermin in camp-car equipment adds much to the comfort of the men who occupy the cars. In quite a number of cases it has reduced the labor turnover, particularly in extra gangs that are so largely composed of transient labor.

Do Not Crowd

By Assistant Bridge and Building Foreman

If sanitary conditions are to be maintained in labor camps it is of prime importance to prevent crowding. For the present, permanent labor camps are practically out of the picture, the camp facilities being confined almost exclusive to mobile camps of bunk and other cars. It is particularly important that crowding be avoided, for if too many men are crowded into cars, the ventilation is likely to be inadequate and the men will not be able to be as cleanly as if they are allowed a reasonable amount of room and good ventilation.

When box cars are converted into camp cars, sufficient openings should be provided to insure the required amount of ventilation. Obsolete passenger cars are particularly suitable for camp car purposes. They can be converted to this use with very little work, and they have so many windows that they assure excellent ventilation. They are also much cooler and more comfortable in the hot summer period than box cars, and are usually easier to keep clean.

All camp cars, regardless of the purpose for which they are used, should be screened to exclude flies, mosquitoes and other insects which are carriers of diseases, besides being pests. The condition of the screening should be inspected early in the year before flies and mosquitoes appear, and any repairs that are needed should be made at once. Similar inspections should be made throughout the season.

Portable sanitary toilets should be provided for each gang housed in camp cars, which should be set up over sanitary pits and which should have all openings to the pit closed so that flies cannot enter. When the gang moves to a new place, the toilets should be removed, loaded on the outfit cars for transportation and set up at the new site. The pits should then be filled with fresh earth.

Foremen should be held responsible for the sanitary condition of their camps and should be required to inspect them frequently to know that the cars and the surroundings are being kept clean, and that the bedding is kept clean. When the walls and

ceilings of the cars become dirty tney should be washed. Bunk cars should be kept painted.

Floors should be scrubbed as often as needed, and experience has shown that this is required often. To insure that these requirements are being carried out, the supervising officer should also make occasional inspections, but at irregular intervals, to satisfy himself that the proper degree of sanitation is being maintained. If it is practicable to do so, bathing facilities should be provided.

It seems almost impossible to prevent infestation of camps by rats, mice, bed bugs, fleas, roaches and other vermin. While such infestation cannot be prevented entirely, it can be kept to so low a level that it becomes of little importance, if proper measures of control are carried out persistently. This control can be maintained by fumigation with any one of several fumigants now available for camp-car use.

These fumigants will exterminate all vermin if they are used in accordance with the directions issued by the manufacturers. It should not be overlooked, however, that they destroy these vermin because they are highly poisonous, and that they are equally dangerous to other animals and persons. They must, therefore, be handled with the greatest of care and only persons experienced in their use should be allowed to do the fumigating. The fumigation should be repeated as often as necessary to keep the camp substantially free of these pests.

One or more men, as needed, should be assigned regularly to do the fumigating. The fumigant is so highly poisonous that there is grave danger in allowing inexperienced persons to attempt it. I have been doing this type of work, or supervising it, for several years and, speaking from experience, I believe that any reasonable amount of money spent for sanitation and the suppression of disease in labor camps will pay many fold. Employees recognize the benefits, they are more comfortable, they do not have to worry about certain types of sickness which sometimes prevail where many men are brought together. They are, therefore, more contented and this is definitely reflected in their labor performance.

Anchoring Track During Floods

What advantage, if any, is there in anchoring track on embankments subject to overflow? How should this be done?

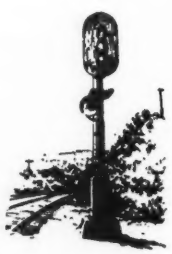
May Be No Advantage

By Engineer Maintenance of Way

One must know the particular conditions surrounding a given section of track before he can determine whether there will be any advantage in anchoring it in preparation for high water. It was demonstrated on many miles of line during the disastrous floods in the Mississippi and Ohio rivers in 1927 and 1937, respectively, that money spent to anchor certain tracks would have been wasted. In other cases, it was demonstrated just as clearly that if the track had been anchored, many times the cost of doing so might have been saved. In some of the latter cases also, the time of restoration would have been shortened considerably.

In general, a track that is subject to overflow by slack water without current, that is, water that does not flow toward or across the track, will not be benefited by anchoring, provided it is not subjected to wave action during the periods of rising and of recession of the flood waters.

If the track will be subjected to a current running across it, it will be desirable to establish suitable anchorage, and the desirability of doing so will increase as the probability that the head of the upstream water will be high and the current swift. Large streams may break over their banks and pile up rapidly on one side of the embankment, finding only slight relief from the established waterways. Again the track may be on bottom land, close to the bordering hills, from which water may rush in flood proportions. A similar but more aggravated situation occurs when a levee protecting the area in which the track is located, breaks.



In these events there will be likely to be a rapid increase in the head, which will produce a strong current flowing across the roadbed and track, the tendency during that part of the rise immediately following the overtopping of the track being to wash out the ballast on the downstream side and shove the track off of the roadbed. If the current is strong enough it may tip the track over, turning it upside down or leaving it in the typical corkscrew condition which is seen so frequently after severe floods.

Peculiar as it may seem, I have known a sudden rush of water to move a section of track several thousand feet long as much as a half mile down stream, leaving the embankment undamaged. Under somewhat similar conditions I have seen long stretches of embankment washed out, with only minor disturbance to the alinement of the track.

In any of the cases cited, except the last one, the cost of anchoring the track would have been only a small fraction of what it cost to restore it to place. The problem then resolves itself into a determination of the frequency with which damaging floods are likely to occur. If they are probable at relatively short intervals, it may be better to raise the track above high water than to anchor it. If they are likely to be of such rare occurrence that they will occur only once in a century it does not seem advisable to worry much about anchorage.

Between these two extremes there are many conditions where anchorage can be applied to advantage on many miles of track. This is done in a number of ways, but I prefer to drive creosoted piles, the length to be determined by local conditions. Since they will be relatively short, there is little danger of damaging the tops if they are well cushioned while being driven, wherefore there will be no cut-off faces to protect as is necessary in pile trestles.

Each pile should have a prebored hole, say 1¼ to 1½ in., about 6 in. or more below its top. The pile should be driven until its top is below the surface of the roadbed. Before the pile is driven, a galvanized cable, preferably ½ or ⅝ in. in diameter, but never less than ⅜ in., should be threaded through the hole in the pile and fastened securely with malleable clips. A forged clip, or preferably a malleable casting, which is designed to fit the base of the rail and to be secured to it by means of a wedge and key, should then be placed on the rail opposite the pile. This clip should have a lug below it, with an opening corresponding to that in the pile. The

other end of the cable should then be passed through this lug and secured with clips, but not drawn too taut.

Many Advantages

By District Engineer

While under some conditions there may be little advantage in anchoring track, if it is subject to current flowing across it it is more than likely that anchorage will be of distinct advantage. Any one who has had to restore track that was washed off the roadbed anywhere from a few feet to several hundred feet will appreciate anchorage that will hold. A poor job of anchoring track may be worse than none at all, for which reason if the job is to be done it should be done well.

Where water flows across the track under conditions that produce a steep hydraulic gradient, it is reasonably certain that the track will be moved unless it is tied down by some dependable method. One method which has been followed with a fair degree of success is to drive posts well into the embankment, drill a hole through the rail or, in some cases, one bolt in the joint is made longer, and fasten the track to the post by means of a galvanized cable. Another method is to drive heavy stakes in the middle of the track and tie the rails to them. Generally speaking, however, these are more or less makeshift methods and are not entirely dependable.

When water first overtops the track the wash is greatest and when it has risen a little higher the track is subjected to the severest strain tending to move it. Another critical situation occurs when the water is at or near the track level or has submerged it slightly. At this time a severe wind storm may do almost as much damage as a strong current.

For these reasons, if the expense of anchoring the track can be justified, the best possible job can be equally justified. It is a waste of money to use untreated timber, for it will last only a short time. The practice of utilizing second-hand ties is still more wasteful, since their life will not be long enough to pay for the labor involved in driving them. It follows, therefore, that the anchor timbers should be sound and it will pay to give them a relatively heavy treatment with a creosote-petroleum mixture that will insure a long life for the anchorage.

The anchorage consists first of creosoted piles driven on the upstream side, until the tops are well below the surface of the roadbed. The driving should be done in such a way that the tops will not be broomed or otherwise damaged, as cutting them off will expose untreated wood that cannot be protected against decay. Opposite each pile a special fastening should be attached to the base of the rail, which will not interfere with the passage of wheels, and this fastening and the pile should be joined with a galvanized cable strong enough to hold the track. This should be not less than ½ in. and may need to be of larger diameter.

No special rule need be followed as to the distance of the piles from the track, except that they should be outside of the ballast for convenience. The distance apart will depend on local conditions but should not be greater than three rail lengths. Ordinarily if anchorage is desirable it is worth while to keep the spacing to two rail lengths or less. The cable does not need to be drawn taut, because a small amount of slack is not detrimental. If, however, the track is likely to be damaged by waves generated by heavy winds, the track should be anchored from both sides, in which event it is desirable to have the cables reasonably taut.

How Deep for a Suction Line?

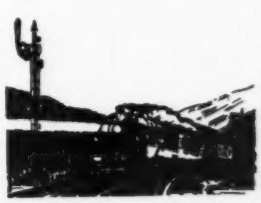
What minimum submergence should be allowed for the intake of a suction line? Why? Does the size of the pipe make any difference?

Submergence Varies

By C. P. Richardson
Engineer Water Service, Chicago, Rock Island & Pacific, Chicago

In general, the minimum submergence and the size of the suction line should vary with the rate of pumping and the source of the water supply. As a rule, the minimum submergence of the intake end of a suction pipe should be at least six diameters below the normal surface of the water. It should be low enough, however, so that it will be properly submerged at low water in the stream or reservoir from which the water is obtained. It should also be deep enough, regardless of other considerations, to avoid drawing in leaves or other debris near the surface of the water. It should not lie on the bottom to suck in silt which may accumulate around it. Above all, the depth should be such that all danger of sucking in air will be avoided. If an ample depth of water is not available naturally, it is good practice to place the intake end on a swing connection to be raised or lowered as the water level changes.

The diameter of the suction line should be great enough practically to eliminate friction head and should vary with the expected rate of flow of water through the pipe. With a centrifugal pump the suction and discharge connections are generally smaller than the proper pipe sizes for suction and discharge lines. For this reason, "increaser" sections should be connected directly to the pump to obtain the most satisfactory and economical operation. While this precaution is more important for centrifugal pumps it is also desirable for all types since it is best to keep the velocity in suction lines down to reduce the friction head through them.



Eliminate Whirlpool

By Inspector of Water Stations

Like so many other questions which arise in railway work, the measures to be taken depend in large measure on local conditions. I have seen cases where a submergence of two diameters was sufficient and others where a submergence of six diameters was barely enough. The important thing, however, is to get the intake end of the pipe far enough below the surface to eliminate whirlpool action as the water is drawn into the pipe. Obviously, therefore, the depth of the intake will depend on the size of the pipe and the capacity of the pump. For any given rate of pumping, the larger the diameter of the suction intake, the less tendency to form an eddy, because the velocity of inflow varies inversely with the diameter of the pipe. The lower the velocity the less pronounced the vortex which tends to form around the intake. It is always better to lower the pipe, where this can be done, than to try to eliminate the visible whirlpool by a float, a baffle or similar device.

New Products Of the Manufacturers

A Device for Straightening Surface-Bent Rails in the Track

TO AVOID the necessity for removing surface-bent rails from the track, John T. Loftus, a roadmaster on the Chicago, Milwaukee, St. Paul & Pacific at La Crosse, Wis., has developed a device, known as the Loftus rail straightener, which is said to straighten surface-bent rails in the track with safety. Briefly, this device consists of a stiff beam, a shackle, a powerful jack, two fixed supports and two adjustable fulcrum blocks.

The beam, which is about 10 ft. long, is made up of two 130-lb. rails, with ¾-in. plates welded to their heads adjacent to the ends, for the purpose of holding them together. For the same purpose, as well as to provide fixed end supports when the straightener is in use, 3-in. by 3¾-in. by 12-in. bars are welded to the bases at each end or the rails. A movable plate having flanges so spaced as to fit over or straddle the rail heads, is placed near the middle of the beam, but can be slid back and forth to any intermediate position, to provide a seat for the jack, which has a capacity of from 50 to 75 tons, depending on the section of rail to be straightened.

An essential part of the device is the shackle, which consists of two 3-in. by 3¾-in. by 17-in. steel bars, having holes at the ends to accommodate 1½-in. rods which are threaded for about 6 in. and 12 in. at their lower and upper ends, respectively, and fitted with nuts. The fulcrum blocks or buttresses, also 3-in. by 3¾-in. by 12-in. are placed between the beam and the track rail, at the ends of the bend in the latter.

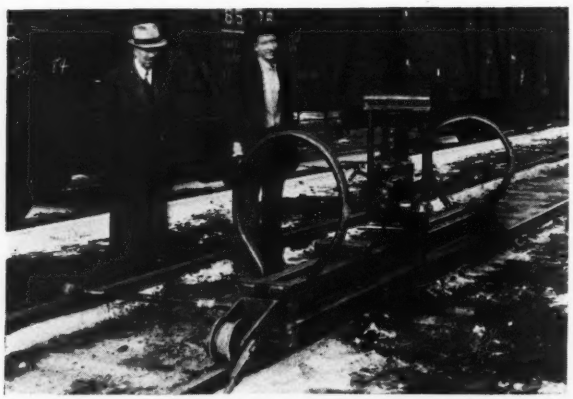
In operation, the beam is placed on the bent rail, resting on the end supports, with the point of maximum deflection at about the center of the beam. The jack plate and jack are then placed approximately over the middle of the bend. The lower bar of the shackle is slipped under the rail, the rods are inserted and the shackle assembly is completed, with the jack directly under the upper bar. The fulcrum blocks are then inserted at about the ends of the bend, and the machine is ready for operation.

As the jack is raised it exerts pressure against the upper bar of the shackle, which is transmitted through the two 1½-in. rods to the lower bar which is under the rail. As the jack is extended, the upward pressure against the base of the rail increases and the rail is forced upward until the bend is straightened out. The jack is then released and the shackle is slipped out from under the rail by the simple expedient of removing one rod from the lower bar and the opposite rod from the upper bar, after which the device is ready to be removed to the next point of operation.

To facilitate moving the straightener, a 24-in. double-flanged wheel is provided at each end. The axles have eccentric cranks, by means of which the beam can be lifted off of its fixed end supports and the load thrown onto the wheels for moving to the next point of use. By reversing the movement of the cranks the beam is lowered to rest on the fixed end supports and the entire operation is repeated.

Two loops are welded to the underside of the beam to form sockets for anchoring one end of an outrigger, by means of keys which can be withdrawn quickly when the straightener is to be removed from the track. The opposite end of the outrigger is equipped with a roller which rests on the rail opposite that upon which the straightener is working, to give lateral support to the beam and its appurtenances. When the rail straightener is to be moved, the fulcrum blocks are taken out and laid on top of the beam, it having been found more convenient to do this than to have them mounted in such manner that they will slide along the rail base.

In preparation for setting up the



Two Views of the New Rail Straightener

machine, the foreman marks the limits of the bend and the point of greatest deflection and the ballast is cleaned from under the rail at the latter point to admit the lower bar of the shackle. The entire operation, including the time required to move to the next bend, requires only a few minutes.

It is said that a gang consisting of a foreman, one or two shovel men to clean the ballast from below the rail, two shackle men who also operate the jacks and two men to raise and lower the wheels and handle the fulcrum blocks, can straighten from 50 to 100 rails a day, depending on the density of traffic, the magnitude of the bends and the distance that must be traveled.

It is also said that of the many hundreds of rails that have been straightened with the Loftus rail straightener over a period of more than three years, not one has broken within the limits of the original bend, although in several cases straightened rails have broken elsewhere, well outside of the bends. Again it is said that in a number of instances rails have been straightened when the atmospheric temperature was in the neighborhood of zero, without breakage either during the straightening operation or subsequently.

Mitred-End Rails Developed by Bethlehem*

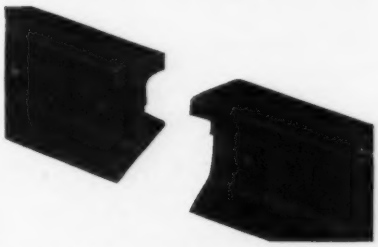
MITRED rail ends, with the advantage which they offer in affording a continuous support for wheels in passing from one rail to the next, now appear to have become entirely practicable from the standpoints of use in the track and of mill production as the result of developments brought about by the Bethlehem Steel Company, Bethlehem, Pa. As a matter of fact, rails with specially designed mitred ends have been in track tests for more than 3½ years, and the company has now perfected a special method and machine for producing the mitred ends on a production basis with an accuracy of shape which makes all mitred rails interchangeable.

The Quenching Step in Rail End Hardening, Which is Recommended for Mitre-Cut Rails

The design of mitred end being produced by Bethlehem has a square cut through the base and lower half of the web, combined with a mitred cut extending through the head and the upper half of the web. Through this design, the advantage of the mitred head is secured, while the square base prevents any tendency for the abutting ends to run by each other and get out of line, as was the case in earlier experiments with mitred rail ends where the mitre extended through the entire depth of the rail.

The earliest experiments with half mitred, half square-cut rail ends proved the practicability of the design, but there were serious obstacles to the production of this type of rail end on a commercial basis since there was no known method for making interchangeable cuts while the rail was at the regular mill sawing temperature. The few rails tried out successfully in track had been machined to shape while cold.

With this situation confronting it, the Bethlehem Steel Company centered its attention upon the development of an economical and workable way of producing the combination mitred-square cuts, which circumstances indicated must be hot sawed in the regular sequence of rail mill operations. In the first attempt to solve the problem, two ordinary structural high-speed saws were mounted astride the roller line close to the location of the regular saws.



A Pair of Mitre-Cut Rails—Note Square Cut Through the Base and Lower Half of the Web

These were so coordinated that after one saw had cut through its part of the rail, it retreated and was followed in its retreat by the other saw, which was linked to the first.

Mitred-square rail ends were produced by this method at the first attempt, but it was found that the results were so inaccurate that only now and then did any two rails fit together, even fairly well. This finding disclosed the fact that the degree of rigidity of the ordinary hot saws was not sufficient to produce the accurate results required. Further study led to the development of a self-contained tool of all-welded, rigid construction, which is capable of such close precision in cutting that all rails now produced are said to be interchangeable.

Already, substantial tonnages of the mitred-end rails have been in service on a number of trunk lines, the earliest installation having been made in 1933. Practically all of these rails have been laid in high-speed main-line tracks, with no special track accessories or fittings, since the end design can be used with any type of joint bar or track fastenings.

It is to be noted also that the mitred ends present no problem at insulated track joints. As a matter of fact, it is said that the necessary twisted fibre end posts can be secured readily, and that, in position, they are protected from the impact of passing wheels by the continuous support provided by the overlapping mitred rails.

The Bethlehem Steel Company feels that the mitre cutting and end hardening of rails are peculiarly correlated and, therefore, recommends that all mitred rails be end hardened, and, vice versa, that all end-hardened rails be mitre cut. It points out that the hardening adds materially to the resistance to battering, and, in turn, that the elimination of the sharp battering blow by reason of the continuous support provided through the

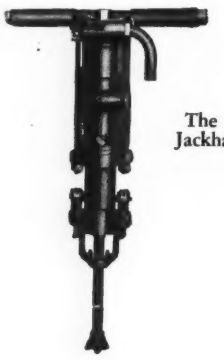
*Photos by courtesy of Bethlehem Steel Company.

mitred ends, makes it safer to use a substantial increase in the hardness of the extreme end of the rail. With the exception of two installations, all mitred rails furnished by the company thus far have been end hardened, and it is said that these rails have given the most satisfactory service.

As regards these installations, it is said that they have caused no trouble whatever, while, on the other hand, the reduction in end batter and noise has been all that was expected. It is said further that such comparative measurements as have been made on square-joint rails and mitred rails laid in the same track and subject to the same traffic, show that while there is a variation in relative batter at joints of the same type of construction, the batter of the mitred and hardened rails appears to be somewhat less than half that of the ordinary square-end rails. As a result of this reduced batter, it is claimed that the riding quality of the track is improved, and that substantial economies are possible in rail-end and rail-joint maintenance, as well as in the maintenance of rolling stock.

JA-55 Jackhammer

THE Ingersoll-Rand Company, New York, has recently added a more powerful unit to its present line of "JA" jackhammers, which not only is designed specifically for the heaviest classes of rock and masonry drilling,



The New Jackhammer

but which is said to have unusually high drilling speed with minimum air consumption. The new unit, known as the "JA"-55, supplements the "JA"-45 and "JA"-30 hammers, both of which are designed for somewhat lighter work. The figure in each case represents the approximate weight of the tool.

As in the case of the lighter units, the new heavy-duty unit can be furnished for dry, blower or wet drilling. The outstanding features of the new unit are said to be its hard-hitting ability, and, therefore, its fast drilling speed, and unusually low air consumption. These features, it is claimed, are brought about essentially by a combination of the weight of the tool and certain special features which are incorporated in the design of the air valve employed.

New Books

Elementary Surveying

ELEMENTARY Surveying, by William Horace Rayner, assistant professor of civil engineering, University of Illinois. 380 pages. Bound in flexible leather. Published by D. Van Nostrand, Inc., 250 Fourth avenue, New York. Price $3.00.

In this book the author has endeavored to impart a working knowledge of the care and use of instruments and as much information as possible concerning their application to the more common problems encountered. It is intended for the man who wishes to familiarize himself with the principles and practices of surveying, rather than for the man who has already acquired a thorough training in this field. The book is designed to supplement rather than to replace the usual handbooks on railroad curves; it covers only the simple circular and vertical curves. Therefore, it is of value primarily to the beginner in surveying or as a reference book on land surveying, the determination of the meridian, use of the stadia rod, etc. An appendix of 80 pages is devoted to tables of trigonometric functions, etc. The chapters, generally, are appended by numerical problems for the student, while a noteworthy feature in the chapters on surveying procedure is the inclusion of sections on mistakes and suggestions on how to avoid them.

Bridge and Building Proceedings

Proceedings of the American Railway Bridge and Building Association for 1936, 176 pages. 6½ in. by 9¾ in. Bound in cloth. Published by the association, 319 North Waller avenue, Chicago. Price $2.

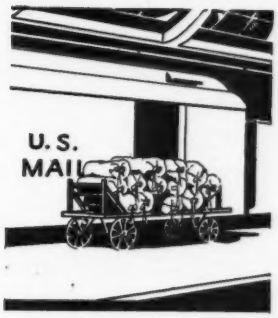
Like its predecessors, this volume contains a full report of the association's forty-third annual convention, held in Chicago last October, including not only the reports, addresses and papers presented but also the discussions from the floor. While the work of the association embraces buildings and water supply facilities as well as bridges, problems relating to the latter are accorded primary attention in this last issue of the proceedings, as illustrated by the following topics—brine drippings, preframing of trestles, woods for use in bridge construction, substructure repair work under water, bridge maintenance for high speed trains, and design problems relating mainly to concrete bridges. The subject of buildings is covered in discussions on roofs, termites and paints, while water service is represented by a report on the inspection and repair of water tanks. These various subjects were presented in the form of seven committee reports and three papers. Four addresses on subjects of a general nature, a report of the business session, the membership roster, etc., occupy the remainder of the volume.

Roadmasters' Proceedings

Proceedings of the Roadmasters' and Maintenance of Way Association for 1936, 170 pages, 6½ in. by 9¾ in. Bound in cloth. Published by the association, 319 North Waller avenue, Chicago. Price $2.

As the Roadmaster's and Maintenance of Way Association adheres to a long established policy in the preparation of the programs for its annual conventions, it is to be expected that the proceedings of its fifty-first convention, held last September, follows pattern of those of previous years. In addition to the usual opening exercises and business session, last year's proceedings embrace five committee reports and nine addresses and papers, together with the stenographic report of the discussions from the floor. Including the discussions, the committee reports embrace 74 pages, individual papers on technical subjects 24 pages, and addresses on more general subjects 12 pages, while a "Question Box" discussion occupies 8 pages. The subject matter presented includes such topics as rail maintenance, the care of ties, track and track maintenance for high speed trains (covered in both a paper and a report), the use of work equipment, the training of foremen, safety, and rail and flange lubricators.

News of the Month



Railroad Purchases 100 Per Cent Higher

Purchases by the Class I railroads of materials and equipment during the first quarter of 1937 are estimated by the Railway Age to total approximately $253,000,000, an increase of 100 per cent as compared with the first three months of 1936. Purchases of materials, equipment and fuel were estimated to total approximately $341,000,000, an increase of 77 per cent as compared with the first quarter of 1936. In almost every class of buying purchases were larger in February than in January, and were larger in March than in February.

Railroad Employment Shows Increase in April

As of the middle of April, the Class I railways, excluding switching and terminal companies, had 1,130,351 employes on their payrolls, an increase of 80,598, or 7.68 per cent, as compared with April, 1936, according to the preliminary report on employment of the Bureau of Statistics of the Interstate Commerce Commission. The number of employes in April also showed an increase of 28,645, or 2.60 per cent, as compared with the previous month. The commission's index of railway employment, which is based on the 1923-25 average as equalling 100, now stands at 63.3.

Safety Awards

Eight steam railroads were given plaques for winning first place honors (in 1936) in their respective groups in reducing employe casualties at the annual banquet of the Railroad Employes National Safety Contest at Chicago on May 17. First place in Group A was won by the Union Pacific Railroad with a casualty rate of 3.13 per 1,000,000 man-hours worked. The Chicago & North Western was second with a rate of 3.43 and the Chicago, Milwaukee, St. Paul & Pacific, first place winner in 1935, was third with a rate of 4.60. Other winners were: Group B (between 20,000,000 and 50,000,000 man-hours)—Atlantic Coast Line, 3.09; Group C (8,000,000 and 20,000,000 man-hours)—Mobile & Ohio, 5.07; Group D (3,000,000 and 8,000,000 man-hours)—Pennsylvania-Reading Seashore Lines, 3.66; Group E (1,000,000 and 3,000,000 man-hours)—New York, Susquehanna & Western, 2.54; and Group F (less than 1,000,000 man-hours)—Lake Superior & Ishpeming, 2.00. The other two groups, covering switching and terminal railroads, included Group A (more than 1,500,000 man-hours)—Chicago River & Indiana, 3.97; and Group B (less than 1,500,000 man-hours)—Conemaugh & Blacklick, 1.07.

Railroad Earnings Expand in March

Further expansion of railroad earnings occurred in March when the net railway operating income of the Class I carriers of the United States totaled $69,379,328, which is at the annual rate of return of 3.47 per cent on their property investment, as compared with a net railway operating income of $35,152,477, or 1.76 per cent, in March, 1936, according to the Bureau of Railway Economics of the Association of American Railroads. Net railway operating income of carriers was larger in March than for any corresponding month since 1930, when it was $61,188,819.

Truck Traffic Increases in March

The movements of commodities by truck in March showed an increase of 26 per cent as compared with March, 1936, and an increase of 19.6 per cent over the monthly average for 1936, according to the monthly survey of truck loadings issued by the American Trucking Associations, Inc. This survey, designed to show merely the trend in commodity movement by truck, is based on comparable reports received from 127 motor carriers in 32 states and the District of Columbia. The actual tonnage reported for March was 477,600 tons, as compared with 379,140 in February and 379,242 in March, 1936.

Streamliners Continue to Draw Business

Judging from reports concerning the volume of business handled by high-speed streamlined trains, this type of equipment continues to hold a high place in public favor. During the first 11 days of its service the "Daylight," new streamlined train of the Southern Pacific operated between Los Angeles, Cal., and San Francisco, hauled a total of 7,813 persons on the 22 trips. Of these 3,763 were southbound and 4,050 were northbound. During the same 11 days the train earned $4.89 per mile northbound and $4.84 per mile southbound. From March 21, the date the new trains went into service, to April 20, the number of passengers carried totaled 18,226 for the 62 trips.

Another evidence of the sustained popularity of high-speed streamlined trains is offered by the fact that passenger traffic handled by the Chicago, Burlington & Quincy between Chicago and the Twin Cities is now more than twice what it was prior to the inauguration of the Zephyr trains on April 21, 1935. The increase during January and February was 126 per cent over the comparable months of 1935.

First "Fold-Boat" Train Operated by New Haven

To the list of sport trains now operated by the railroads, including snow trains, bicycle trains and "fan" excursions, must now be added the "fold-boat" train. This is the designation applied to special trains carrying boatmen equipped with folding boats, which are operated from urban centers to some stream, where the boats are launched and paddled to a specified point where they are picked up by the same train. The first such train in America was operated by the New York, New Haven & Hartford on Sunday, May 16, between New York and Falls Village, Conn., 111 miles. From the latter point the boatmen paddled down the Housatonic river 14 miles to Flanders from where the return trip began. About 200 persons participated.

Super Chief Gets New Streamlined Equipment

The Super Chief of the Atchison, Topeka & Santa Fe, which operates between Chicago and Los Angeles on a 39¼-hr. schedule, was furnished with complete new light-weight, streamlined equipment on May 18. This train now consists of nine streamlined stainless steel non-articulated cars drawn by a two-unit 3600-hp. streamlined Diesel locomotive. Prior to being placed in service the new Super Chief made a number of trial runs between Chicago and Los Angeles which culminated on May 17 in the setting of a new record for the west-to-east run between these points. On that date the new train traveled the 2,228 miles between Los Angeles and Chicago in 36 hr. 49 min., or at 60½ m.p.h., which was 2 hr. faster than the best previous record.

Loss and Damage and the Maintenance Man

"The maintenance man can do much to help prevent accidents and so-called rough handling, and thereby aid in the campaign to keep loss and damage to freight under control," says a recent bulletin of the Association of American Railroads. The bulletin then quotes figures designed to illustrate the enormity the freight claims paid by the railroads. These claims, it says, "would more than pay three times the cost of small tools and supplies in 1935 and would pay half the cost for the entire roadway maintenance expense, both yard and main line." Roadmasters, track supervisors and section foremen are asked to attend loss and damage prevention meetings wherever possible. Maintenance men are also requested to be on the alert for those track conditions, which are found particularly at switches, that are likely to result in

derailments or in rough-riding track.

It is pointed out that, while the car department handles the operation of restoring equipment to the rails, the maintenance man is usually first on the ground and can do much to protect freight exposed as the result of derailments, pending the arrival of others. "Much of the losses due to derailments," says the bulletin, "can be prevented by protective measures immediately following the accident." Pointing out that "in many respects the campaign to reduce loss and damage to freight parallels the safety campaign,' the bulletin quotes figures of the Interstate Commerce Commission to show that many train accidents result from defects in or improper maintenance of way and structures.

Retirement Bill Introduced in Congress

A further step toward enactment of retirement legislation was consummated on May 11, when a new railroad retirement bill was introduced in the Senate by Senator Wagner of New York. A similar bill was presented in the House of Representatives by Representative Crosser of Ohio. The retirement bill, with the pending tax bill, is designed to set up the pension system agreed upon in the recent management-labor compromise, as modified by the tax increase demands of the United States Treasury. In offering the bill to the Senate, Senator Wagner expressed his gratification "at the agreement between the workers and the railroads which has resulted in this bill." He called the accord "another sign of reaching the industrial stage of peace instead of strife."

Railroads to Continue Public Relations Work

Continuance of public relations work on behalf of the railroads during the fiscal year beginning June 1, 1937, became assured when the advertising budget of the Association of American Railroads was approved at a meeting in Chicago on April 29. The public relations work will include advertising in general, farm and business magazines and railroad and labor publications, and an expansion of the several services performed by the association. Material coming under the latter heading includes motion pictures for exhibition before the public and railroad employes, window displays, station exhibits, addresses by railroad representatives and direct-mail literature. The association is also considering more extensive use of radio broadcasting, the introduction of an annual railroad show and an exhibit train.

Association News

Metropolitan Track Supervisors' Club

The annual meeting and outing of the club will be held on June 10 at the Houvenkopf Country Club, near Suffern, N. Y. The program for the day will include golf in the morning, an open-air luncheon at noon and a program of sports in the afternoon. At the meeting, immediately following the luncheon, new officers will be elected.

Wood-Preservers' Association

The Executive committee will meet at Madison, Wis., on Thursday, June 10. Other committees of the association have been invited to meet at the same time. The program includes an inspection of the Forest Products Laboratory, with luncheon in the laboratory, followed by a review by a member of the laboratory staff of the work under way and in prospect at the laboratory.

International Railway Maintenance Club

A meeting of the club on May 20, at the Hotel Royal York, Toronto, Ont., Can., was addressed by H. H. Harman, engineer of track, Bessemer & Lake Erie, on the subject of, "Continuous Welded Track." Mr. Harman's comments, which had to do primarily with the one-mile section of welded track on the Bessemer & Lake Erie, employing Thermit-pressure welds and GEO track fastenings, was illustrated by motion pictures.

American Railway Engineering Association

On May 1, Secretary E. H. Fritch, who had announced at the March convention his desire to retire, stepped out of office, and Frank McNellis was appointed acting secretary with the title of assistant secretary until Mr. Fritch's successor is appointed. A committee of the Board of Direction was appointed to prepare a specification covering the qualifications to be required in the appointee, and this committee will report at the next meeting of the board, which will be held at Toronto, Ont., on June 25.

The March Bulletin is now on the press and will be ready for mailing the first week in June. It will contain the formal addresses presented at the convention by Dr. H. F. Moore's third progress report on the rail investigation, Dr. A. N. Talbot's discussion of stresses in track, a memoir for Past-President E. H. Lee and a reprint of the Outline of Work and Personnel of Committees.

The supplement to the Manual is ready for the printer and will be issued in July. More than 900 copies of the new Manual have been sold to date.

Seven committees held meetings in May, these being Shops and Locomotive Terminals, at Chicago, on May 4; Buildings, at Chicago, on May 5; Iron and Steel Structure, at Pittsburgh, Pa., on May 6 and 7; Track, at Chicago, on May 12; Economics of Railway Labor, at Kansas City, Mo., on May 20 and 21; Maintenance of Way Work Equipment, at Chicago, on May 25; and Records and Accounts, at New York, on May 27.

Three committees have scheduled meetings for June, as follows: Masonry, at Urbana, Ill., on June 1; Water Service, Sanitation and Fire Protection, at Buffalo, N. Y., on June 9 and 10; and Economics of Railway Operation, at Montreal, Quebec, on June 24.

New subjects for investigation and report have been assigned to 18 of the association's 31 committees in the booklet on Outline of Work and Personnel of Committees that was mailed to all committee members early in May. The list below gives the new subjects assigned, following the name of each committee affected.

Roadway—Roadway slope protection.

Ballast—Develop relationship of ballast materials between service behavior and results obtained by Los Angeles testing machine.

Rail—Specifications for relayer rail; and thermal treatment of rail.

Track—Welding of manganese castings in special trackwork; bolt tension necessary for proper supporting of rail joints; lubrication of rail on curves; design of cut track spikes for use with AREA toeless joint bars; and prevention of brine drippings on track structures, collaborating with Mechanical division.

Buildings—Insulation of railway buildings; maintenance of wearing surfaces of platforms and floors in railway buildings; and design of railway buildings to withstand earthquake shocks.

Wood Bridges and Trestles—Fireproofing wood bridges and trestles, including placing of fire stops; and specifications and design of fastenings for timber structures.

Masonry—Investigation of the merits of the vacuum method of treatment of concrete after placement.

Highways—Lamps on manual and automatic crossing gates, collaborating with Signal section.

Rules and Organization—Prepare rules for the welding of frogs, switches and rail ends in track, collaborating with the Committees on Track and the Committee on Economics of Railway Labor.

Water Service, Fire Protection and Sanitation—Taste and odor control of drinking water; types of tannins used in water treatment; and fire hydrants, design, operation and maintenance.

Yards and Terminals—Passenger station layouts; and classification yards, collaborating with the Committee on Economics of Railway Operation.

Iron and Steel Structures—Investigate and analyze failures and faulty details of steel railway bridges.

Economics of Railway Location—Spirals required for high speed operation.

Uniform General Contract Forms—

Form of agreement for commercial signs on railway property.

Economics of Railway Labor—Meeting tomorrow's demands for labor and supervisory force in competition with other industry.

Shops and Locomotive Terminals—Drop pits—driver and truck for modern locomotives.

Waterways and Harbors—Develop the ruling heights and width in the design of inland waterway craft which control vertical and horizontal clearances of bridges over waterways.

Maintenance of Way Work Equipment—Self-contained direct blow gasoline tampers; sand blasting equipment; and gasoline and electric driven portable pumps.

Maintenance Subjects Feature New York Meeting

The meeting of the New York Railroad Club, at the Engineering Societies Building, New York, on May 21, was designated "United States Steel Night," and consisted of a program in which representatives of the Steel Corporation and its subsidiaries discussed recent metallurgical developments brought about by the corporation in the interest of producing steels better adapted to railway requirements. Features of the meeting included a paper by Frank R. Layng, chief engineer of the Bessemer & Lake Erie, describing the experiment being carried out on his road with one track-mile of Thermit welded rail and GEO track fastenings, and a description of the Brunorizing process of rail manufacture, presented by R. E. Zimmerman, vice-president in charge of metallurgy and research, of the corporation. A description of the mile of welded track on the Besemer & Lake Erie was presented in *Railway Engineering & Maintenance* for June, 1936.

Motors—The line of polyphase wound-rotor or slip-ring, ball-bearing, induction motors manufactured by Fairbanks, Morse & Company, Chicago, are described and illustrated in Bulletin No. 1600 which was recently issued by this company.

Floor Repair and Resurfacing—The Stonhard Company, Philadelphia, Pa., has published a three-page folder which includes answers to 22 questions covering Stonhard resurfacer, its adaptability to different types of floor construction, and the method of its application.

Johns-Manville Industrial Products—The Johns-Manville Corporation, New York, has issued the 1936 edition of its Industrial Products catalogue, a 60-page booklet, profusely illustrated, which contains information, recommendations and specifications with regard to the wide range of products manufactured by this company for industrial use. Some of the products or subjects given prominent attention, which are of special interest to the maintenance of way department, include insulating materials for various types of structures, asbestos built-up roofs, insulated roofs, corrugated Transite roofing and siding, Transite conduit, and Transite pressure pipe for water mains.

Personal Mention

General

A. R. Carver, division engineer on the Cumberland division of the Baltimore & Ohio, with headquarters at Cumberland, Md., has been promoted to acting superintendent of the Wheeling division, at Wheeling, W. Va., succeeding **C. B. Gorsuch.**

John R. Watt, assistant purchasing agent of the Louisville & Nashville and formerly engineer maintenance of way of this road, has been advanced to general purchasing agent with headquarters as before at Louisville, Ky. Mr. Watt has been in the service of the Louisville & Nashville for 42 years. He was born on April 16, 1884, at Greenfield, Ohio, and

John R. Watt

attended Salem academy, South Salem, Ohio, and later the University of Ohio. He entered railway service in August, 1905, as a rodman on the Louisville division of the L. & N., serving as an instrumentman and assistant engineer on the Cumberland Valley and Louisville divisions, as assistant engineer at Birmingham, Ala., and for a short time in the chief engineer's office at Louisville. In 1914 he was promoted to roadmaster of the Nashville division, which position he held until 1917, when he was further advanced to general roadmaster with headquarters at Louisville. On February 15, 1932, Mr. Watt was advanced to engineer maintenance of way, which position he held until his appointment as assistant purchasing agent which took place during the spring of 1936.

John Edwards, Jr., assistant division superintendent on the Baltimore & Ohio, with headquarters at Baltimore, Md., who, as late as July 15, 1936, was division engineer on the Monongah division, at Grafton, W. Va., has been promoted to superintendent of the Monongah division at Grafton, succeeding **H. R. Gibson.** Mr. Edwards entered the service of the Baltimore & Ohio on July 19, 1912, as a painter in the maintenance of way department at Baltimore, later becoming a rodman. In April, 1916, he was appointed transitman and became track supervisor at Connellsville, Pa., in October of the same year. On July 1, 1917, Mr. Edwards was promoted to assistant division engineer at Philadelphia, Pa., but two months later was furloughed for military duty. He re-

John Edwards, Jr.

turned to the railroad on July 1, 1919, as assistant division engineer at Cumberland, Md., being transferred to Pittsburgh, Pa., on May 1, 1925. He was promoted to division engineer of the Monongah division on August 1, 1929, and on July 15, 1936, became assistant superintendent of the Baltimore division at Baltimore, which position he held until his recent promotion to superintendent of the Monongah division.

Duncan J. Kerr, assistant to the president of the Lehigh Valley, and an engineer by training and experience, has been elected president of this company with headquarters as before at New York. Mr. Kerr was born on December 3, 1883, at

Duncan J. Kerr

Glasgow, Scotland, and was graduated from the University of Glasgow in 1904 with the degree of Bachelor of Science in civil engineering. His first railway service was with the Pennsylvania, which connection he began in November, 1904. Five years later Mr. Kerr went with the Chicago, Milwaukee & Puget Sound (now the Chicago, Milwaukee, St. Paul & Pacific). From 1910 to 1913 he served with the Oregon Trunk and the Spokane, Portland & Seattle, then entering the service

of the Great Northern, where he subsequently became office engineer, corporate engineer and assistant to the vice-president in the executive department. On December 1, 1920, Mr. Kerr was appointed assistant to the vice-president in charge of operation, holding this position until 1936, when he left the Great Northern to become assistant to the president of the Lehigh Valley with headquarters at New York. He was occupying the latter position at the time of his recent election as president of the Lehigh Valley.

M. J. Parr, trainmaster of the Columbus division of the Central of Georgia, with headquarters at Cedartown, Ga., and formerly a roadmaster on this road, has been appointed superintendent of the Savannah division. Mr. Parr was born on September 5, 1884, at Chesterland, Ohio, and was educated at Ohio State University. He entered railway service in June, 1904, on the Pennsylvania, lines west, and during the sumers of 1904 and 1905, and from June, 1906, to March, 1907, he was assistant on the engineering corps of the same road. On March 18, 1907, he entered the service of the Central of Georgia as a draftsman in the engineering department at Savannah. He was promoted to assistant engineer in January, 1909, and in May, 1914, was advanced to pilot engineer. In May, 1915, Mr. Parr became supervisor of bridges and buildings of the Columbus division and in January, 1917, he was

M. J. Parr

appointed roadmaster for the Macon division, which position he held until June, 1918, when he resigned to enter the army. After a brief term as assistant trainmaster of the Southwest and Columbus divisions, he was appointed trainmaster of the Southwest division on October 13, 1919, and on October 16, 1925, he was appointed superintendent of the Macon freight terminals. On September 1, 1930, these terminals were consolidated with the Macon division and placed under the division superintendent and Mr. Parr was again appointed trainmaster of the Southwest division at Albany, Ga. Following the further consolidation of divisions in October, 1931, Mr. Parr was assigned to the Columbus division as trainmaster.

W. E. Smith, general manager of the Louisville & Nashville, who served in the maintenance and construction departments of this company for many years, has been appointed to the newly-created position of vice-president and general manager. Mr. Smith has been identified with the L. & N. continuously for 52 years. He is a native of Georgetown, Ind., and was born on September 13, 1868. He obtained his first railway experience as a water

W. E. Smith

boy on the L. & N. at the age of 12 years, serving in this capacity during school vacations. After completing his studies Mr. Smith re-entered the service of the L. & N. as a section laborer on April 1, 1885, at London, Ky. On January 1, 1887, he was promoted to section foreman and on March 20, 1888, he was further advanced to crosstie inspector and to clerk in the roadmaster's office. On June 25, 1890, Mr. Smith was promoted to track supervisor, serving in this capacity on the Lebanon branch and on the Cumberland Valley division until March 20, 1895, when he was made roadmaster of the Lebanon branch. After serving in this capacity on various divisions he was promoted to assistant superintendent of the Birmingham division on August 1, 1905, in which capacity he was in charge of maintenance of way and structures. Seven years later he was given the title of superintendent of construction for the entire system, serving in this position until December 1, 1914, when he was appointed superintendent at Evansville, Ind. On November 1, 1920, he was transferred to the Birmingham division and on January 1, 1924, he was promoted to assistant general manager, being further advanced to general manager on January 15, 1931.

Engineering

H. K. Carter has been appointed assistant engineer on the Cleveland, Cincinnati, Chicago & St. Louis with headquarters at Mattoon, Ill., to succeed **Fred Myers,** who has resigned.

H. G. Dennis, master carpenter of the Chicago division of the Chicago, Rock Island & Pacific with headquarters at Chicago, has been appointed division engineer of the same division, to fill a position that was abolished several years ago and has recently been recreated.

J. E. Beatty, engineer maintenance of way of the Eastern lines of the Canadian Pacific, and **W. O. Cudworth** and **N. E. Gutelius,** assistant engineers maintenance of way, Eastern lines, now have headquarters at Toronto, Ont., as a result of the shifting of the headquarters of the operating department, Eastern lines, from Montreal, Que., to Toronto, which took place on May 1.

Bernard R. Perkins, who has been connected with the engineering department of the Delaware & Hudson for seven years has been appointed assistant engineer on the Missouri-Kansas-Texas with headquarters at St. Louis, Mo., to succeed **C. L. Dodson,** who has resigned. Mr. Dodson has been connected with the engineering department of the Katy since 1929 and has been in charge of revision of standards.

C. J. Jaeschke, division engineer on the Missouri Pacific at Poplar Bluff, Mo., has been transferred to Little Rock, Ark., with jurisdiction over the Arkansas division. **H. D. Knecht,** division engineer at Little Rock, has been transferred to St. Louis, Mo., with jurisdiction over the St. Louis Terminal-Illinois divisions. **V. C. Halpin,** division engineer at St. Louis, has been transferred to the Missouri-Memphis divisions, with headquarters at Poplar Bluff.

E. J. Clopton, assistant division engineer on the Baltimore division of the Baltimore & Ohio at Baltimore, Md., has been promoted to division engineer of the Monongah division at Grafton, W. Va., to succeed **H. L. Exley,** who has been transferred to the Cumberland division with headquarters at Cumberland, Md., to take the place of **A. R. Carver,** who has been appointed acting superintendent of the Wheeling division at Wheeling, W. Va., as noted elsewhere in these columns.

Mr. Clopton, who was born on November 12, 1893, at Anniston, Ala., received his higher education at the Virginia Military Institute, from which he was graduated in 1914. He entered railway service on July 1, 1916, as a rodman on the Baltimore & Ohio, but on April 30, 1917, he left the railroad to become 1st lieutenant, field artillery, U.S. Reserve Corps. In September, 1919, he returned to the B. & O. as an inspector in the office of the chief engineer maintenance, and held this position until 1923, when he was promoted to track supervisor, with headquarters at Philadelphia, Pa. In 1927, Mr. Clopton was appointed assistant division engineer, at Baltimore, Md., the position he was holding at the time of his recent promotion to division engineer.

Track

T. L. Jones, a track supervisor on the Missouri Pacific with headquarters at Scott City, Kan., has been promoted to roadmaster with headquarters at Wagner, Okla., to succeed **J. M. Kirk,** whose death is noted elsewhere in these columns.

M. C. Michaelis, assistant roadmaster on the Gulf, Colorado & Santa Fe with headquarters at Alvin, Tex., has been promoted to roadmaster with headquar-

ters at Silsbee, Tex., to succeed **M. M. Killen,** whose appointment as general foreman of bridges and buildings and water service is noted elsewhere in these columns.

G. Honey, has been appointed roadmaster of the Second Track division of the St. Louis-San Francisco, with headquarters at Cuba, Mo., succeeding **W. E. Counts,** retired.

W. H. Johnson, a section foreman on the Canadian National with headquarters at Capreol, Ont., has been appointed acting roadmaster on the Capreol division with the same headquarters to relieve **E. Haystead,** who is off duty because of illness.

Dewitt T. Hester, who has been appointed track supervisor on the Illinois Central, as reported in the May issue of *Railway Engineering and Maintenance,* has served with the Illinois Central for about 22 years. He was born on December 9, 1893, at Mathiston, Miss., and entered the employ of the Illinois Central on December 10, 1913, as an assistant foreman. On October 18, 1915, Mr. Hester was advanced to extra gang foreman, which position he held continuously until October 31, 1931, except for a period of two years when he served in France as a construction and maintenance foreman with the railway engineers of the United States Army. From April 1, 1931, until his recent appointment as supervisor of track, Mr. Hester served as a maintenance foreman. He is now located at Moorhead, Miss.

Water Service

J. H. Bugg, water service supervisor on the Canadian National at London, Ont., has retired on a pension. **A. C. Sachs,** pipefitter in the water service department, has been appointed general foreman of water service and the position of water service supervisor has been abolished.

Mr. Bugg was born on April 19, 1872, and entered the service of the Grand Trunk (now Canadian National) as a pipefitter in 1908. Two years later he was advanced to water service foreman at the Toronto (Ont.) Terminals, which position he held until 1927, when he was further promoted to water service supervisor on the London division.

Bridge and Building

F. W. Hutcheson, assistant supervisor of bridges and buildings on the Chesapeake & Ohio, with headquarters at Clifton Forge, Va., has been transferred to Newport News, Va., to replace **H. M. Harlow,** who has been transferred to Clifton Forge.

M. M. Killen, roadmaster on the Gulf, Colorado & Santa Fe at Silsbee, Tex., has been appointed general foreman of bridges and buildings and water service of the Gulf division with headquarters at Galveston, Tex., to succeed **Sam Lincoln,** who has retired.

James J. Meacham has been appointed bridge and building supervisor on the Northern Pacific with headquarters at Seattle, Wash., to succeed **Andrew Herider,** who has retired after 56 years of service with this company. **Andrew Hanson,** bridge and building supervisor at Glendive, Mont., has returned from a leave of absence and **Angel Monson,** who acted as bridge and building supervisor at Glendive during the absence of Mr. Hanson, has been appointed assistant supervisor of bridges and buildings.

Otto Czamanske, assistant chief carpenter of the Milwaukee Terminals of the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to master carpenter of the Superior division with headquarters as before at Milwaukee, Wis. This is a new position which has been created following the rearrangement of several divisions.

Obituary

John M. Kirk, roadmaster on the Missouri Pacific with headquarters at Coffeyville, Kan., died on March 16 at Oakland, Cal.

Supply Trade News

General

The Bucyrus-Erie Company, South Milwaukee, Wis., has moved its Seattle, Wash., office to 3408 First avenue. **James W. Bell,** Cedar Rapids, Iowa, has been appointed distributor in that territory.

The general sales offices of the **American Steel & Wire Company** have been moved to Cleveland, Ohio, from Chicago, in order to centralize them at the company's headquarters. Regional sales offices will be maintained in New York, Chicago and Baltimore.

Personal

Stanley T. Scofield who has conducted the sales research department of the **United States Steel Corporation,** New York, since 1932, has been appointed assistant to vice-president.

Edward J. Mehren has resigned as president of the **Portland Cement Association,** effective August 31, to devote his time to personal interests. Mr. Mehren has held this position since 1931.

The Massey Concrete Products Corporation, with general offices in the Peoples Gas building, Chicago, has made changes in the officers of the corporation, effective May 1, as follows: **J. S. Hobson,** chairman of the board; **G. A. Blackmore,** president; **Charles Gilman,** first vice-president and general manager; **G. H. Redding,** vice-president; and **B. F. Landers,** acting vice-president, secretary-treasurer.

P. W. Giannini, formerly head of the Traffic Equipment Corporation, New York, is now associated with the **Aeroil Burner Company, Inc.,** West New York, N. J., as manager of its new **Traffic Equipment division.** The Aeroil Burner Company is now the sole licensee for the manufacture and sale of all products formerly made by the Traffic Equipment Corporation, including "Reflectostrip," and "Reflectosignals."

R. A. Carr, managing director of the Buenos Aires branch handling the South American business of the **Dearborn Chemical Company,** has been elected vice-president with headquarters in Chicago to succeed **C. M. Hoffman,** who is now located in Los Angeles, Cal., where he is engaging in special work for the Dearborn Chemical Company. Mr. Carr was born at Oak Park, Ill., and after graduating from the University of Chicago in 1926, engaged in advertising work. Later, he entered the employ of the Locomotive Fire Box Company, Chicago, and in 1927 was a member of the dynamometer car staff of the Southern Pacific at San Francisco, Cal. In 1928, he re-entered the employ of the Locomotive Fire Box Company, engaging in sales and production work, which position he held until 1934, when he entered the service of the Dearborn Chemical Company.

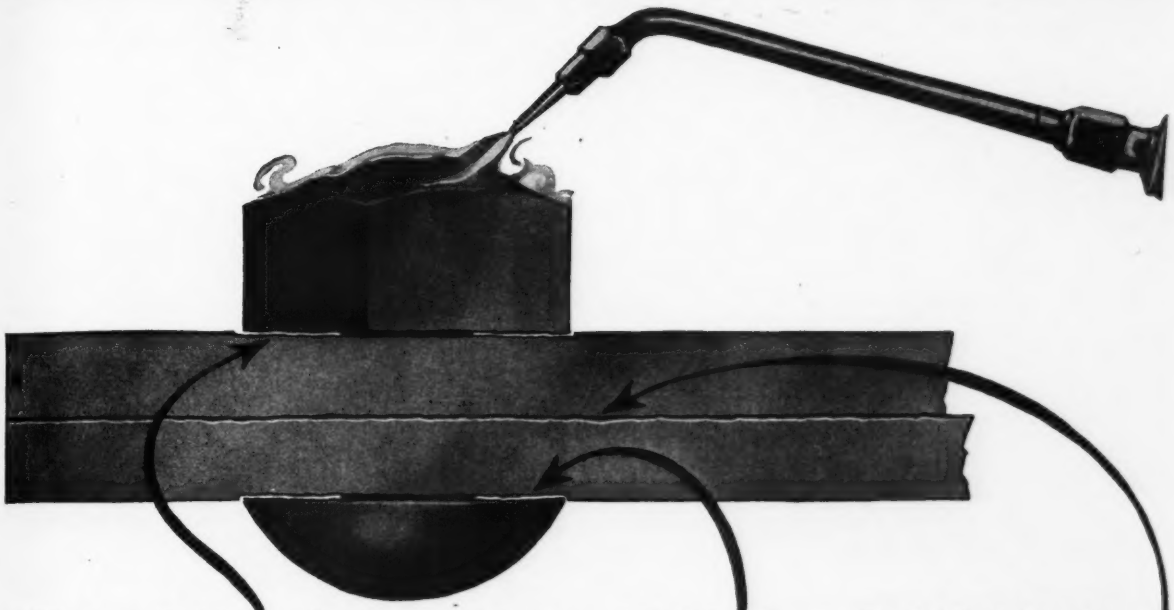
R. A. Carr

Trade Publications

American Locomotive Cranes—The various types of locomotive cranes manufactured by the American Hoist & Derrick Company, St. Paul, Minn., are featured in 16-page brochure, known as bulletin No. LB-2, recently issued by this company. The various cranes are described briefly and the principal uses are illustrated by means of photographs. This bulletin is attractively printed in color.

Teco Timber Connectors—In a bulletin of 12 pages, the Timber Engineering Company, a subsidiary of the National Lumber Manufacturers Association, presents an exposition of the timber connector as a means of increasing the efficiency of wood-to-wood or wood-to-metal joints. The treatment is non-technical, the object being to illustrate and explain what the conectors are, how they are applied and to what sort of structures they have been applied. Information is given also on their effectiveness compared with bolts as well as on the cost of framing work in which the connectors are used.

EVEN IF YOU WELDED THE NUT AND BOLT INTO ONE IMMOVABLE MASS



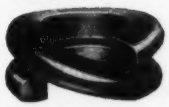
still inevitable vibration and wear would loosen the bolted structure

HERE and HERE and HERE

1 IMPROVED HIPOWER

2 DOUBLE HIPOWER

3 NATIONAL RIB WASHER



4 ANKOR HIPOWER

5 NATIONAL COLLAR GROOVED

6 THACKERAY SPRING WASHER

ONLY A SPRING WASHER CAN SUSTAIN THE BOLT TENSION UNTIL THE TRACK MAN COMES AGAIN.. *only a spring washer!*

That is why Hipower Spring Washers more than pay for themselves in reduced upkeep costs—less labor and maintenance—fewer renewals and repairs.

Hipowers prolong the life of rail and of all joint parts.

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Over 50 years of research and improvements—over 50 years of tests and trials—over 50 years of widespread use by leading railroads prove our spring washers to be one of the best railroad investments.

THE NATIONAL LOCK WASHER COMPANY, Newark, N. J.

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TO RAILWAY SUPPLY MANUFACTURERS

You can't sit on your tail AND GET BUSINESS

even though the railways are buying twice as much as they did a year ago and three times as much as two years ago.

New materials—new devices—new methods of work—conflicting demands regarding projects to be undertaken—active competition from new as well as old manufacturers—new men in official positions to be educated to your products and their merits—all these conditions enter into your sales problem today.

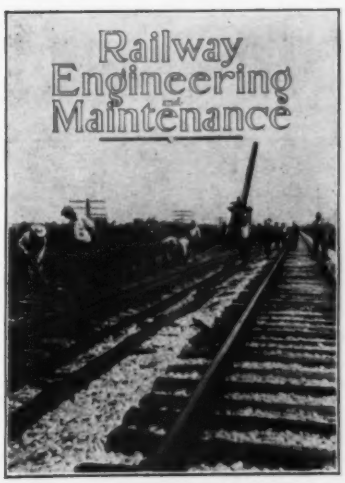
The opportunity is present, for the railways are buying.

But are they buying your materials in the quantities you think they should?

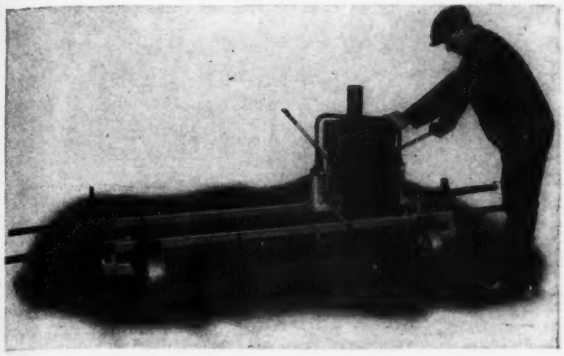
Are you using the means available to familiarize your potential customers with the merits of your products?

Are you presenting your story to them from month to month in the magazine which they read first of all?

Now is the time for ACTION.



RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS



Model P-11, Rail Joint Cross Grinder

A portable cross grinder for removing overflowed metal from rail ends and slotting closed and welded joints. This machine, owing to certain mechanical features, attains high production, accuracy, efficiency and economy.

Speed with Safety

Speed is in demand. So is safety. You can combine them only on safe track. That means track free from battered rail ends, cupped joints, corrugated rail, worn switches, frogs and crossings. Welding and grinding rejuvenate worn track. Grinding is a quick, economical operation with Railway Track-work Grinders—types for all conditions and requirements. Data Bulletins sent on request.

Model P-22—Portable Flexible Shaft Grinder, gasoline engine driven free hand grinder operating either a cup or straight grinding wheel for grinding surface welded joints, crossings, frogs, switch points and stock rail. One of many models.

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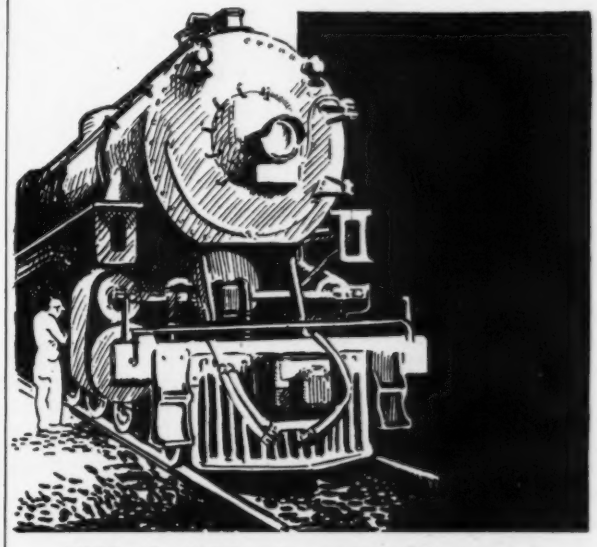
WORLD'S HEADQUARTERS FOR TRACK GRINDERS

7242

DUFF-NORTON

THE MOST WIDELY USED TRACK JACKS IN THE RAILROAD INDUSTRY



Vital to railroad efficiency is proper track maintenance and vital to track maintenance are dependable Duff-Norton Genuine Barrett Trip or Track Jacks—the standard of safety, durability and long life throughout the railroad industry. Every one is a "thoroughbred"—reinforced at vital points of greatest wear and made to stand the gaff of the hardest railroad service. Operating parts are interchangeable too, adding years of service and the maximum of economy—just a few reasons why Duff-Norton is a standard railroad specification.

No. 1-D Double Acting Track Jack

No. 117 Single Acting Trip Jack

No. 110 Combination Trip and Lowering Jack

THE DUFF-NORTON MANUFACTURING CO.

PITTSBURGH, PA.

"THE HOUSE THAT JACKS BUILT"

ALPHABETICAL INDEX TO ADVERTISERS